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The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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Contents

	PAGE
Belgium and British Iron and Steel	261
The Foundry Exhibition	261
Correspondence	262
Book Review	262
Publications Received	262
The Sir John Cass Technical Institute	262
Random Shots	262
Commercial Moulding Sand Control for the Tyneside Founder	263
High-Duty Cast Iron in the Foundry	266
Notes from the Branches	266, 274
The Scrap Situation	266
Complex Foundry Problems	267
London Foundrymen Elect New Officers	270
Davy Bros., Limited	272
Edgar Allen & Company, Limited	272
Heat and Power as By-Products	272
Pipe Dipping Plant	273
This Week's News in Brief	274
Trade Talk	274
Company Reports	274
Contracts Open	274
Personal	274
Obituary	274
New Companies	274
Raw Material Markets	276
Catalogue Received	276
Applications for Trade Marks	276

Belgium and British Iron and Steel

Shortly after the announcement of the increased tariff on iron and steel goods coming into this country the news arrived that Belgium had left the gold standard. We understand that technically the country will remain on gold but only by the aid of a substantial cut in the external value of the currency and by suspending gold payments. The belga is to be devalued by a quarter or a third.

The relations between Belgium and Great Britain have always been of the most cordial character and the connection of the two countries through the iron and steel trade has been particularly intimate. While Belgian people are the first to recognise the necessity for the fiscal policy this country has had to pursue for the past few years, it has always been a source of regret to us that the policy should have excluded Belgian goods. The general effect of the change will be to bring Belgium into "Sterlingarea," that group of countries, including Great Britain and Scandinavia, in which the pound sterling is the trade index rather than the price of gold, which some economists suggest is less stable than sterling. They say, not that we slipped off gold, but that gold slipped away from us. The extraordinary stability of prices in the home market confirms this view, and the pound sterling is still worth twenty shillings at home, even if in France or Italy or Germany and "gold" countries, it is worth little more than one-half. The change in Belgium is bound to affect Holland, and France cannot remain unaffected. From the immediate point of view the change almost nullifies the effect of the increased tariff on iron and steel as far as Belgium is concerned, for Belgium and Luxemburg, which form one customs union, are responsible for nearly two-thirds of the foreign iron and steel entering this country. Whether some quota system will have to be imposed to deal with this situation remains to be seen. The drop between 1929 and 1933 of all Belgian imports into the United Kingdom is roughly paralleled by the drop of British imports into Belgium, both having fallen to about one-fourth.

Whatever the immediate consequences, the change is bound to promote international currency stabilisation, and this will deprive this country of the advantage it has enjoyed in certain markets by restoring something like the equilibrium once automatically effected by gold. At the moment the iron and steel position is obscured by the fact that Belgium and Luxemburg are members of the international steel cartel, which controls prices and output. Whether these countries will now regain their freedom of action remains to be seen.

The Foundry Exhibition

For the first time in history, the forthcoming Foundry Exhibition will be a foundry exhibition in the fullest sense of the word, for not only will there be a representative exhibit of the raw materials and plant used by the industry, but, in addition, about fifty foundry owners also have exhibits. Moreover, the Institute of British Foundrymen have also taken space, and the co-operation of the Department of Scientific and Industrial Research, which will no doubt include the Cast Iron Research Association, is confidently anticipated.

Steel castings will be shown by Messrs. Kryn & Lahy, of Letchworth; Hopkinsons, Limited, of Huddersfield, and probably Firth Vickers Stainless Steels, Limited, of Sheffield. The special iron castings shown by Sheepbridge Stokes Company, of Chesterfield, will naturally be centrifugally-cast material, but in most other cases we imagine that the castings will be built up into the machines the exhibitors manufacture. The non-ferrous foundries, however, are particularly well represented, and amongst them are Robert W. Coan, Limited, of London; Fry's Die Castings, Limited, of Merton Abbey; High-Duty Alloys, Limited, of Slough, and Non-Ferrous Die Casting Company, of London. We would specially ask every exhibitor possessing a foundry to add to the interest of the exhibition by emphasising, wherever possible, the great progress recently registered within the foundry industry. This factor is extremely important as "weldings" are certain to be featured as direct competitors of castings by certain exhibitors. If the personnel of the stands were familiarised with the foundry end of the business by showing that the results of co-operation between designer and foundryman had increased strength, reduced waste weight or eliminated the number of components, then the level of salesmanship would be enhanced and good propaganda be established for castings in general. We also suggest that the foundry personnel should be attached to the stand for at least a portion of the duration of the exhibition. This would enable the foundry staff to study thoroughly the exhibits in the foundry equipment and supply section and to gain a general knowledge of what the engineer is now demanding from the foundryman. The direct hearing of adverse criticism or approbation of his part of the work of creating machinery should be helpful, as normally such remarks reach him indirectly, and become somewhat coloured.

With a little co-operation, the forthcoming exhibition can be made more valuable to the exhibitor and to the foundry industry than any other manifestation ever organised.

C

XUM

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Sand-blasting

To the Editor of The Foundry Trade Journal.

Sir,—In the recent discussions in your Journal on sand-blasting, there is one very important point that has not been made sufficiently clear.

When changing over from sand or flint to metallic abrasives, the operator will get a different finish but, generally for practical purposes, a better finish. There is a habit on the part of the uninstructed operator to go on blasting in the hope of getting a finish that he has been used to getting with sand or flint, but this is impossible, and he should not spend more time on the job than he has done previously.

Not long ago we had this exact experience in a well-known foundry, and the manager was good enough to take the writer's advice and do the castings at the same speed as had been done previously. He had one of them enamelled immediately, which proved that the finish was in every way satisfactory.

Throughout a very long experience we have never found an objection to metallic abrasives to be maintained when fair opportunity has been given for the adaptation of metallic abrasives.—Yours, etc.,

Alfred Edwards,
Managing Director,
Harrison Bros. (England), Limited,
Middlesbrough.

[This letter has been slightly condensed.—Ed.]

To the Editor of The Foundry Trade Journal.

Sir,—In reply to Mr. Nurcombe's letter in your issue of March 28, I have nothing to add to my letter published on February 21 and stand by every statement and claim therein expressed.—Yours, etc.,

Kenneth Hill.

6, Ranelagh Avenue,
Hurlingham, S.W.6.

April 14, 1935.

[This correspondence is now closed.—Ed.]

Book Review

Bibliography of Non-Metallic Inclusions in Iron and Steel. Compiled by Lois F. McCombs and Morris Schrero. Published by the Mining and Metallurgical Advisory Boards, Carnegie Institute of Technology, Pittsburg, Pennsylvania, U.S.A. Price 4 dollars.

Mr. E. H. McClelland, who writes the Introduction to this monumental work, has no need to be apologetic, because work done in 1933 and 1934 is not completely included. When it is realised that due note is taken of the work of Dr. H. C. Sorby, the father of metallography, and that there are no less than 2,136 references quoted, some notion will be given of the completeness and extent of this compilation. We were just a little astonished, and we must confess somewhat pleased, with the enormous number of references to the pages of The Foundry Trade Journal. We had no idea we had devoted so much space to this fascinating subject of non-metallic inclusions, but we certainly attach so much importance to it that we strongly advise that this book should be available to every metallurgist charged with the supervision of steel or iron for making high-grade castings.—V. C. F.

Publications Received

Metal 'treatment. No. 1. Published quarterly by Industrial Newspapers, Limited, 49, Wellington Street, London, W.C.2. Price 1s.

The object of this new magazine is to provide reliable information on metallurgical and engineering subjects associated with the lighter and secondary industries by publishing articles by recognised authorities on the latest alloys and their subsequent working into articles of commerce. What is more important, however, is that the method of presentation shall conform with the highest standards of presentation known to the printing industry.

Obviously, we are very familiar with the world's metallurgical Press, and we are bound to concede that never has any country achieved such a high standard of excellence in the presentation of a technical magazine. Amongst household names in the foundry industry who have contributed to this first number are Prof. J. H. Andrew, Dr. Hatfield, Dr. Everest and Mr. F. W. Rowe. In the other fields covered, the names are equally well known. The subjects dealt with include Metallic Powders; Heat-Treatment; Progress in Bronze Founding; Thermal Efficiencies of Furnaces; Grain Size Control for Forging Steel; Intercrystalline Corrosion Problem; Use of Ferrous Metals for Aeronautical Purposes; Heat-Treatment of Nickel Alloys; New Magnet Alloys; Milling Cutters; The Structure and Mechanical Properties of Large Forgings; and the Life of Turning Tools as Affected by Shape. We have outlined the contents in order clearly to indicate the field which has actually been covered. The price has been kept exceptionally low and few would grumble if they were called upon to pay double.

The Directory of Quarries, Clayworks, Sand and Gravel Pits. 1935 (Sixth Edition). Published by The Quarry Managers' Journal, Limited, Salisbury Square House, London, E.C. 4. Price 6s. net.

We are very appreciative of the worth of this directory. We applied a number of tests having reference to obscure, yet commercial, deposits of moulding sands, and in no case were we disappointed. In just one case, the sand pit was listed under the Clay Works Section. The arrangement is quite good: first there is an alphabetical list, subdivided for each letter into Quarries; Clay Works; and Sand and Gravel Pits. Then comes a geographical classification, similarly subdivided. In the list of proprietary names we are not quite so satisfied. Staybrite, for instance, is listed as belonging to "John Firth, Limited," whilst such well-known names as "Silacene," "Yorkshire," "Albino," have been omitted. Again, a definite mineral entity is also given as a trade name, though that, of course, may not be the fault of the publishers. Apart from this, we are well satisfied that the directory has been very carefully prepared, and is, therefore, a really valuable work of reference for industrialists generally.

The Sir John Cass Technical Institute

The Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C.3, has organised a course of lectures on Pulverised Fuel. This course, which will consist of lectures of an advanced character is arranged for advanced and post-graduate students and for those who, being associated with industries in which steam-raising is an important factor, desire to keep up to date in respect to recent developments. It has also been arranged for those who are interested in the application of pulverised fuel to firing metallurgical and other furnaces. The lecturers include Prof. C. H. Lander, Comdr. H. D. Tollemache and L. M. Jockel. The fee for the course, which commences on April 30, is 10s.

Random Shots

Streamline tuyeres are the latest advance in cupola design. Have you installed them yet? If not, you are neglecting an opportunity of tapping better metal at lower cost. Miss Nellie Snookers, designer of the new-type tuyere, tells "Marksman" that in her own plant a 20 per cent. saving in melting costs has been secured. Associated with this is the advantage of a 10 per cent. increase in the physical properties of the iron. Air compressors function much more efficiently; the cupola lining lasts longer; patching is reduced to a minimum; and the melters' wives are now leading altogether happier lives.

* * *

Miss Snookers' production plans for this summer include a novel gadget for increasing home comfort. It is designed for unknowing use by the Unwelcome Guest. The device consists simply of a plate of cast iron, chill cast, about an inch thick, and roughly the shape of a chair seat. The bottom is flat and covered with thin baize, whilst the top has a specially corrugated surface. Placed on the seat of a chair and covered by a soft cushion this device has been known to shorten the customary duration of the most thick-skinned U.G.'s visit by as much as 75 per cent.

* * *

In addition to the home and office chair pattern, Miss Snookers hopes to commence on the production of a mattress model and a model for automobile seats. The U.G. Seat Foundation unfortunately was not available in quantity in time for demonstration at the Ideal Home Exhibition. The reason for this was some difficulty in getting the required hardness on the chill face (100 Shore). This has been overcome, and deliveries in bulk are now being made. A short trial of the Foundation in any office—even though it be the chief buyer's—will convince you that it is worth its weight in gold.

* * *

Everybody takes an interest in the appropriateness, or otherwise, of names, such as Kilham and Dearden, for a medical partnership, Ruff for a dentist, Death for a butcher, much after the Happy Family nomenclature—Bun the Baker, and Snip the Tailor—but surely there was never anything so extraordinary as that the very first student to be enrolled on the list of the Institute of British Foundrymen should be called "Baby." Mr. Baby is an apprentice patternmaker at Goulds' Foundries at Cardiff, and "Marksman" hopes to live to the day when he will be the doyen of the Institute.

* * *

Rastus: "Say, Sambo, what time in yo' life does yo' think yo' was scared de worst?"

Sambo: "Once when Ah wuz callin' on a henhouse an' de farmer come in an' ketched me. Boy, wuz Ah scared?"

Rastus: "How am yo' suah dat was de worstest yo' evah bin scared?"

Sambo: "Cause de farmer grab me by de shoulder an' he say: 'White boy, what yo' doin' here?'"

* * *

Whilst holidaymaking at a seaside resort an Englishman met an old friend.

"Hullo, what are you doing here, Sandy," he asked.

"I'm on my honeymoon," said Sandy.

"Lucky fellow," said his friend. "Introduce me to your wife."

"Och, she didn't come," was Sandy's answer. "I left her at home. She's been here before."

Marksman.

XUM

Commercial Moulding Sand Control for the Tyneside Founder

By FRANK HUDSON (Chief Metallurgist, Glenfield and Kennedy, Limited)

Mr. Hudson's Paper, which was presented to the Newcastle Branch of the Institute of British Foundrymen, Mr. Robson presiding, might by its title be thought to be of local interest only. Actually, it is one of the most valuable practical contributions ever made to the study of foundry sands.

Introduction

Personal experience of Tyneside conditions dates back some ten years, and in order to bring this knowledge up to date it was decided to ask representative local foundries to submit samples of moulding sand for test purposes, together with a filled-in questionnaire giving a guide as to existing practice. From the results obtained it was hoped to be in a position to remark upon local practice and criticise it favourably, or unfavourably, as the case might be, in a plain outspoken way such as any one of us may adopt in the foundry when discussing with each other the numerous problems that go to make life interesting and the job worth while.

Seven Tyneside foundries were asked to co-operate, out of which four complied. At the time, this response was disheartening, as it was particularly desired to deal with the full aspect of the case, including steel, cast-iron and non-ferrous practices. However, so many interesting points were obtained from the samples and information forwarded by those who did co-operate, that the author is now extremely grateful that the first appeal was not fulfilled.

The type of sands submitted for examination were those in the green- and dry-sand group. No samples of loam were asked to be forwarded and this is now regretted, as very little work has been conducted on this important branch of casting production, and there is great need of reliable information in this direction, appertaining as it does to the manufacture of the larger castings, so extensively used on the Tyne and Clyde for shipbuilding requirements. However, an effort will be made to correct this omission by including a section on loam in subsequent remarks.

At this stage the author would like sincerely to thank those foundries which co-operated by forwarding samples of sand and details of their respective practices, and whilst he would like to have mentioned individual names, it has been considered advisable to designate these four firms by the letters A, B, C and D.

Preconceived Erroneous Notions

Prior to discussing the properties of Tyneside moulding sands, it will be no doubt necessary to give a *résumé* of those points which each foundryman should keep in mind when considering a subject such as this. Most practical men have wrong conceptions of the necessary properties required of sands to produce castings and take far too much for granted in their use of these materials. If a serious attempt be made to study moulding sands, and if concrete facts are substituted for present belief, it is surprising how rapidly a new outlook is obtained, differing entirely from those views handed down along the steps of time. In the past foundrymen were afraid to alter their views regarding moulding sands because they knew so little of the truth, but this cannot be accepted as an excuse for the future, as everyone to-day can obtain inexpensive apparatus to help him find the truth. Intelligent use of sand-testing apparatus together with absolute faith in the facts so gained will go far in giving that new conception so badly needed to-day.

All the tests made for this Paper have been conducted on the apparatus recommended by the Sands and Refractories Technical Sub-Committee of the Institute. Most, no doubt, will have some idea of this equipment, as it has been fully described by the author and others at various times.*

* Foundry Trade Journal, December 21, 1933, page 351, *et seq.*

Sand Preparation

Following the question of testing apparatus, it is natural that some thought should be given to sand-preparation methods. A good sand-preparation plant is an undoubted help in obtaining efficient sand control, but an elaborate and expensive sand-preparation system is not a primary essential. The main determining factors in this direction are intimately connected with production and foundry lay-out, and it is not proposed to deal with this aspect in this Paper. It is considered, however, that a modern and efficient method of mixing is essential, for both facing and backing sands, if good results are to be obtained, and the general census of opinions undoubtedly lies with the sand mill. It might, however, be interesting to indicate the results obtained since the inception of sand-control methods in the Glenfield & Kennedy foundries. During the past year they have experienced the following benefits:—(1) Obtained a reduction of 50 per cent. in sand costs; (2) reduced the percentage of defective work by over 1 per cent., making the average percentage from all causes 3 per cent.; (3) obtained castings having better finish and appearance; (4) obtained an increase of 12½ per cent. in production of castings; and (5) prevented waste to a point of having practically no old sand to be dumped.

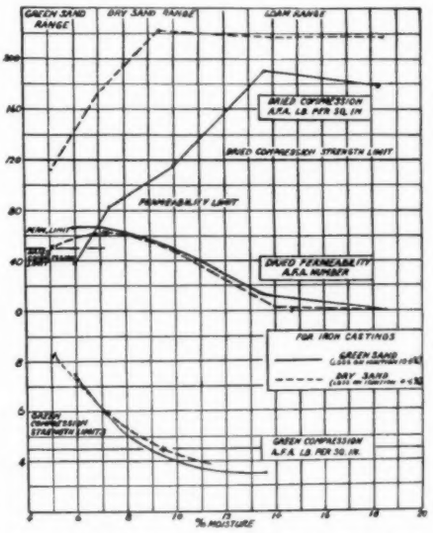


Fig. 1.—Showing how Green Sand, Dry Sand and Loam are Fundamentally the Same except for Moisture and Coal-Dust Additions.

The financial value of these five points is considerable, and, so far as Glenfield & Kennedy are concerned, the question of routine sand control is recognised as an indispensable asset to the firm.

Following the question of sand-testing methods and preparation equipment, the next point that arises is the necessary properties of sand required for production of various types of castings. Any information so far obtained has been the result of private enterprise, but the Sand and Refractories Sub-Committee have now taken this matter in hand, and are collecting samples of the various mixtures in service, throughout the country, with the view of issuing a specification of physical properties at an early date. In conjunction with the collection of samples, co-operating firms are asked to complete a simple questionnaire giving the necessary particulars of their respective practices so that the physical properties of the sands employed can be co-ordinated with types of castings produced. The results obtained for this Paper are the first step in the right direction.

A New Start

There is still a very great deal to learn about all the properties required of sand to effect safe production of various castings, and before illustrating the physical properties of sand in use in Tyneside foundries it is essential to have an understanding of some of the fundamental characteristics. The author has more or less specialised in the study of sand for the past 10 years, and some of the results obtained and opinions reached in that period may be of interest. During the first eight years very little progress was made, and it was a matter for conjecture what was the matter and where was the stumbling block. After careful thought, the conclusion reached was that the stumbling block must be personal, due to training and contact with the foundry industry, which had given rise to preconceived ideas which were unconsciously being accepted as facts. There was the belief shared by most that it was essential to use plenty of new sand to prevent sand deteriorating and producing bad castings. It was assumed that the sand, so far as iron castings were concerned, silted up with repeated use. Another assumption was that the mixtures used for green sand, dry sand and loam were fundamentally of different type, and that there was such a thing as permeable loam.

Two years ago it was decided to forget these beliefs and work on nothing but facts. The collection of these fundamental facts has entailed considerable research, by no means yet complete, but it has resulted in the production of something tangible and directly responsible for the rapid progress sand control has made in the Glenfield foundries during that time. The advice tendered to all interested in moulding-sand control is this—forget beliefs and start afresh on facts.

Fundamental Facts

In the production of machinery and shipbuilding castings so closely allied to the Tyne and Clyde, the fundamental facts of a general nature are as follow:—

Green sand, dry sand and loams are fundamentally the same except for moisture and coal-dust additions.—By this it is implied that it is possible to produce satisfactory castings by these three branches of moulding practice through the use of a standard sand mixture, adding a certain amount of coal dust for green sand and controlling the moisture content accordingly for dry-sand and loam production. Fig. 1 gives some indication of the reasons leading up to this assumption. This graph shows the physical characteristics of green- and dry-sand mixtures at various moisture contents, together with the limits found to produce good castings. One will observe that the properties of the two sands are very similar with the exception of the dried compression strength and loss on ignition due to coal dust present in the green sand. It will also be observed that in the green-sand range, the dry sand fulfills all the requirements for the safe production of green-sand castings as well as the green sand. In the dry-sand range, the addition of 10.4 per cent. moisture to the green sand

brings this sand into suitable condition for dry-sand-moulding purposes, whilst in the loam range both the sands tested meet requirements.

It is obvious that a universal sand mixture could be easily devised to meet green-sand, dry-sand and loam conditions, and, by controlling moisture content and the addition of coal dust, have the necessary properties for satisfactory

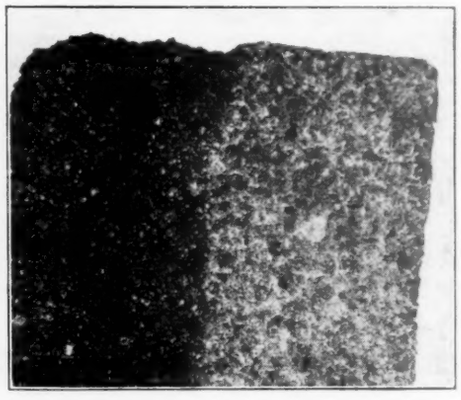


Fig. 2.—This Block is of One Piece of Sand, with Differing Quantities of Moisture.

casting production. The effect of moisture on permeability in the loam range should be particularly noticed. Out of numerous samples of loam tested from various sources, none has so far been found that exhibited any appreciable degree of permeability, and it is considered that, with the present methods in use, a permeable loam will never be obtained. Fig. 2 illustrates this point more definitely. Upon first examination one might think that there are two distinctly different sands present. As a matter of fact, this section is made from the same sand, a local sand from Consett at that; only one side has been made at 7.5 per cent. moisture, giving an A.F.A. permeability number of 156, whilst the other side contains 24 per cent. moisture and has a permeability of only 4.0. This sample was not subjected to any milling action, and accordingly the large reduction in permeability cannot be attributed to reduction of grain size, but is entirely due to the effect of moisture filling up the spaces between the grains with bonding material. These tests explode another belief, namely, the production of permeable loam. For practical purposes all loam made is relatively impermeable.

The Silt Fallacy

A further point brought out during the last two years' work is the fact that most sands in use for iron and non-ferrous casting production do not silt up with repeated use. Personal experience does not cover the effect of steel castings on this point, so there is no qualification to deal with this end of the subject. In regard to the production of cast iron, however, it is worth recording that the standard green-sand mixture in service in the author's foundry for grey-iron production, during the past 18 months, contained at least 98 per cent. floor sand. This has been used over and over again in the sand plant previously described,* and weekly grading tests have shown that the sand to-day actually contains less silt, although there is no provision made for removing silt on the plant. A more definite confirmation of this fact was obtained when the plant was first started up. Previous to its installation a large percentage of new sand was used to make facing sand, and this practice had been in use for many years, with the result that the floor sand was very rich, and it was decided to operate on 100 per cent. floor sand until suitable properties were obtained. It took six months to bring the sand down to the level required, and after this period the percentage of silt in the sand was found to be considerably reduced. It is considered that the main reason for sands silting up in iron-foundry practice is due to excessive addition of new sands and the consequent increase in the clay and silt grades, inefficient mixing methods being a contributory factor to the need of excessive new-sand additions, together with an accumulation of iron particles in the sand. The value of electro-magnetic separation of *all* iron particles from sand cannot be too highly stressed in preserving longevity. During the immediate past six months, observations have been taken on dry-sand mixtures as used for castings up to 20 tons, and, so far as can at present be seen, the same findings result.

In regard to brass-foundry practice, personal tests fail to indicate the formation of silt through repeated use of moulding sand. In this department, a single sand has been used for green-sand work during the past 50 years, and has had no additions made to it apart from that required at infrequent intervals to maintain stock, nor has it been treated in any way.

There are several other fundamental facts of a general nature that could be mentioned, but the foregoing are probably sufficient for the purpose of this Paper. As well as these general facts, some knowledge is required of special properties required to control the various classes of sand mixtures employed for the production of machinery castings.

Properties Required of Green Sand

Considering the question of green-bond strength, observations taken over several years indicate that a value of 4 to 6 lbs. per sq. in. on the A.F.A. apparatus is ample for the production of the majority of grey-iron machinery castings. Sands giving a higher green-bond strength than this are generally unduly strong, and it can be concluded that the mixtures in operation are not economical. Furthermore, strongly-bonded sands do not work well on many moulding machines, as they lack "flowability" and will not compact, causing "bridging," soft spots and swollen castings. On the other hand, the use of sands with a lower bond strength than the limits given is dangerous, leading to scabbing or drop-outs.

For brassfoundry practice the above values can also be applied, although the lower limit can be safely dropped down to 3 lbs. per sq. in. without causing serious trouble.

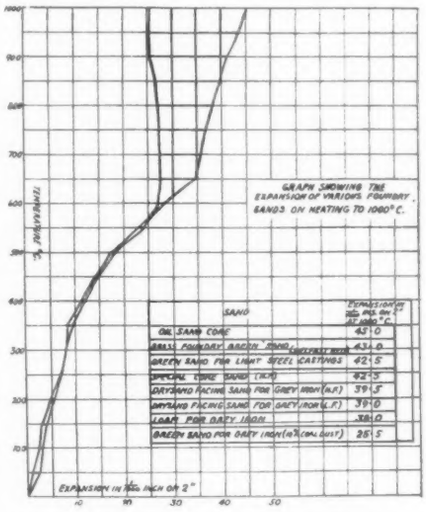
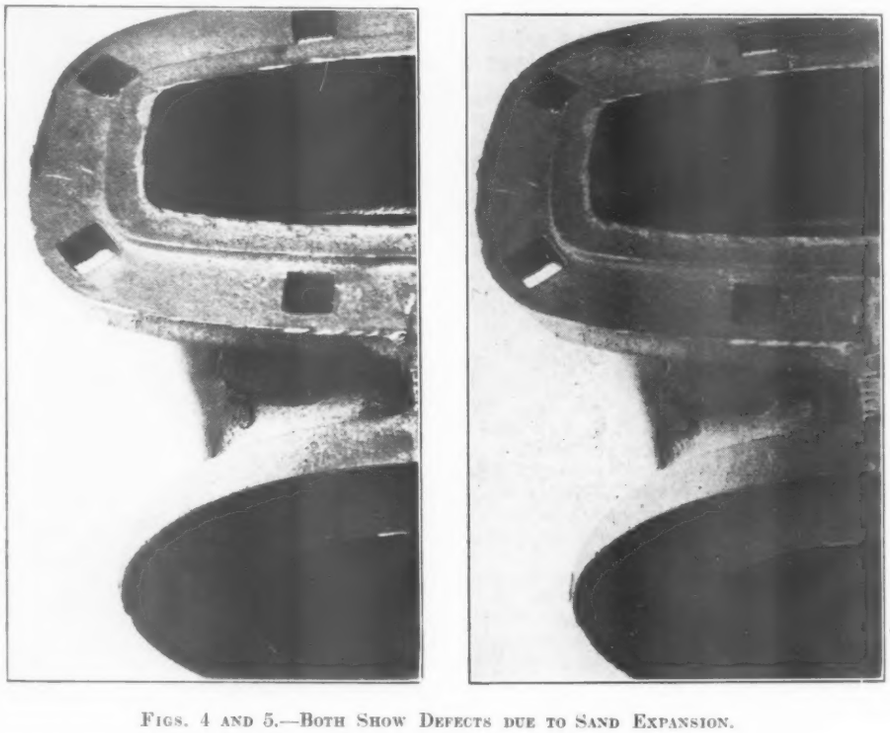

GRAPH SHOWING THE EXPANSION OF VARIOUS FOUNDRY SANDS ON HEATING TO 1000° C.
SAND
EXPANSION IN INCH ON 2"
OIL SAND CORE 43·0
BRASS FOUNDRY FACING SAND 43·0
GREEN SAND FOR LIGHT STEEL CASTINGS 42·5
SPECIAL CORE SAND (DRY) 42·5
DRY SAND FACING SAND FOR GREY IRON (A.F.) 39·5
DRY SAND FACING SAND FOR GREY IRON (L.F.) 39·0
LOAM FOR GREY IRON 38·0
GREEN SAND FOR GREY IRON (6% COAL DUST) 25·5

Fig. 3.—Expansion of Various Foundry Sands on Heating to 1,000 deg. C.

As well as green-bond strength the question of dried-bond strength is of considerable importance in the manufacture of green-sand castings. It will be appreciated that every green-sand mould has parts of its surface transformed into dry sand during the casting operation and suggested safe limits for this property are between 45 to 75 lbs. per sq. in. compression on the A.F.A. apparatus.

Control of this factor has a very important effect on the elimination of "sand holes," the lower value being a sure guide in this direction, whilst the higher limit more or less controls mixture cost. These values can also be applied to the production of general non-ferrous castings



Figs. 4 and 5.—Both Show Defects due to Sand Expansion.

* Foundry Trade Journal, December 21, 1933, page 351, *et seq.*

such as gunmetal and brass, although certain modifications are required for light-alloy castings.

Permeability for Green Sand

The permeability limit for green sand for machinery castings produced on Tyneside should not be below 60 A.F.A. number if the best results are to be obtained. With this limit it is safe to employ moisture contents up to 7 per cent. and coal-dust additions up to 7½ per cent., providing the castings are not unduly large. For the larger castings in green sand above 10 cwts. in weight, higher permeability values are advisable. The question of the most suitable permeability for brassfoundry practice is not so easily answered. The production of non-ferrous castings embraces so many alloys having totally different properties from cast iron that it is not possible to be dogmatic on this point. For example, the casting of yellow brass, particularly for pressure-resisting castings, entails the use of a very permeable mould to allow the escape of zinc fume. If the mould has a satisfactory degree of permeability to meet this condition the castings have a poor surface finish and the problem resolves itself into a compromise between the two and the use of artificial venting.

The production of green-sand castings in gunmetal is much more simple than brass from the sand point of view, and a permeability value not below 20 A.F.A. number has been proved to be very satisfactory. The effect of sand on surface finish is a most important factor in the brassfoundry, and recent tests conducted indicate that if a proper knowledge of the question is required it will be determined by a study of such properties as metal viscosity, surface-tension values, etc., and not by the relative fluidity of the metals employed. Relative fluidity tests conducted on cast iron and phosphor bronze indicate that cast iron has a much higher relative fluidity value than phosphor bronze, yet castings in this latter metal are infinitely more difficult to produce from green sand with a good surface finish.

Expansion of Sands

The last point to mention in regard to the production of green-sand castings is relative to the properties of sand at high temperatures. Present knowledge of moulding sands will never be complete without information in this direction, and at present the author is conducting considerable research upon the matter. Initial work commenced with a study of the expansion of sands and it was found that various sands exhibited marked differences in this direction. Fig. 3 illustrates some of the results obtained in exploratory tests. It will be observed that oil-sand cores have the greatest expansion, whilst green sand containing coal dust gave the lowest figure, about 43 per cent. less expansion taking place. In conjunction with the strength of sand at high temperatures, it is hoped that information of considerable fundamental value will be obtained. Much of this work has still to be completed. It has been found, however, that the expansion of moulding sands can cause casting defects of the type shown in Figs. 4 and 5.

This type of defect in the practical vernacular is called by such names as "a gauze," "dumb or blind scab," etc., but a more correct designation is a "sand buckle." It has been found that green sands having a low coefficient of expansion produce this defect less readily than those having a high coefficient of expansion, and the degree of expansion bears a strong relationship to the percentage of coal dust present in the green sand. Fig. 6 illustrates the expansion of green sand containing various percentages of coal dust. It is interesting to note that the addition of 10 per cent. coal dust affects the maximum reduction in expansion and any further addition of coal dust causes the expansion to again increase. For practical purposes the addition of over 7½ per cent. coal dust appears to be quite unnecessary.

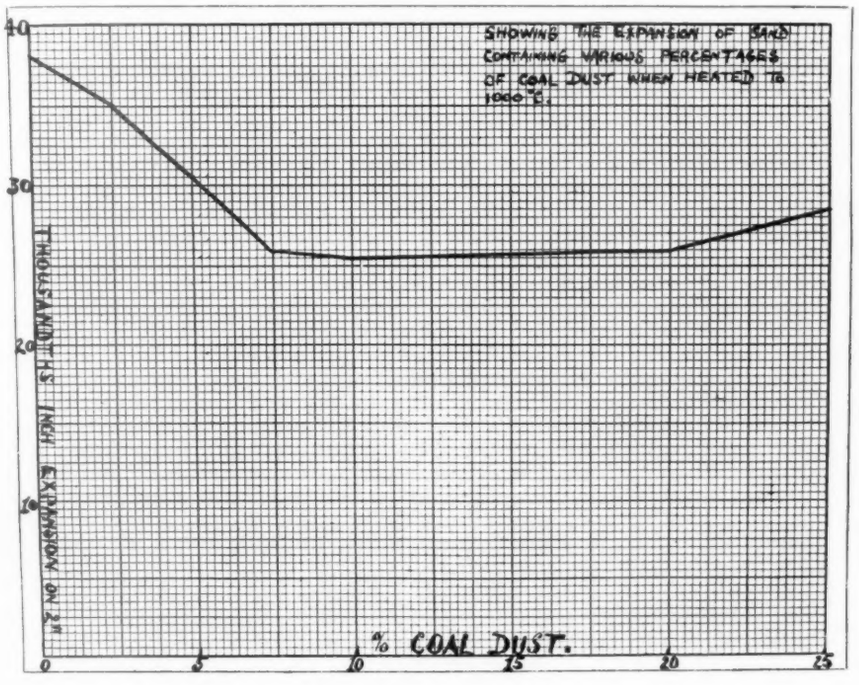


Fig. 6.—Showing the Expansion of Sand containing Various Percentages of Coal Dust when Heated to 1,000 deg. C.

In applying these green-sand values and facts into practice it is considered that the best results are obtained using a combined facing and backing sand. If this is impracticable every effort should be made to have the properties of the backing sand as near similar to the facing material as possible with the exception of coal-dust additions.

Properties Required of Dry Sand

So far as the green-bond strength of dry sand is concerned, the limits already given for green sand are satisfactory, namely 4.0 to 6.0 lbs. per sq. in. compression on the A.F.A. apparatus. In regard to dried compression strength, it is not advisable to work with sand having a value below 120 lbs. per sq. in., and this can with safety be increased up to a minimum of 150 lbs. per sq. in. for large work. These limits are of particular importance for sand used for facing purposes. Whilst it is considered perfectly feasible to use a combined facing and backing sand for green-sand practice, there is a considerable risk of obtaining cracked castings if this principle is applied to dry-sand work, and the strength of the dry-sand backing sand should be lower than the facing material. In personal practice, the strength of the backing sand is between 20 to 60 lbs. per sq. in. in dried compression.

The question of the permeability of dry sand is a debatable point. If the moulding materials used do not evolve gas on heating and are free from such things as saw dust, manure, etc., and are perfectly dry, then theoretically a high permeability value is not required. Unfortunately the ideal is not always attainable, and in the case of large dry-sand castings made in the floor these are never absolutely dry. In many cases they are only skin-dried to a depth of a few inches, and accordingly, with the present knowledge available, and the size of the casting at stake, it is wise to play safely. For dry-sand work it is considered that the permeability value should not be below 80 A.F.A. number.

The sand mixtures employed to obtain and maintain the required physical properties of green- and dry-sand moulding mixtures in the Glenfield foundries, so far as the production of iron castings are concerned, can be stated as follows:—

Green Sand.—A combined facing and backing sand is employed for general purposes which is prepared by milling for 2 min. a mixture composed of approximately 1.0 per cent. new bonded sand, 0.6 per cent. coal dust, 0.125 per cent. liquid binder for the improvement of dried strength, 98.275 per cent. green-sand floor sand and 7.0 per cent. moisture (max.).

Slight modifications are made according to the results shown by the daily routine sand tests to obtain the necessary uniformity and correction of variables occasioned by the addition of burnt oil-sand core-sand, but the above are the maximum additions required. In isolated cases, for the safe production of certain castings of special design and which are liable to be affected by sand expansion, the coal dust is increased along the lines previously discussed.

Dry-Sand Facing Sand.—66.6 per cent. dry-sand floor sand; 33.3 per cent. old crushed oil-sand cores; 0.75 per cent. Bentonite, and 9 per ment. moisture (max.). This is milled for 10 min. The Bentonite addition is modified, within small limits according to the results obtained by daily routine sand tests. The backing sand used for dry-sand moulds is the floor sand from above, tempered, and put through a Royer aerating and mixing machine.

Loam

In assessing the values required of loam for casting production, the first point to require attention is that of cohesion, the property which enables loam to stick to over-hanging or vertical mould sections without bulging, running or falling off. Many loams have enough bond present to satisfy practical application in this direction, but if deficient, an addition of cow hair is the obvious remedy. This commodity is the only thing keeping many domestic ceilings up at home, and if one has been unfortunate enough to buy a new house and awake one morning with plaster all over the place one will probably find the builder forgot to add the cow hair when mixing the plaster, or else put in just a little to satisfy his conscience. The addition of cow hair to loam is entirely intended to maintain cohesion in the green state.

Loam of satisfactory quality should, theoretically have a slightly higher strength than

(*Continued on page* 269.)

XUM

High-Duty Cast Iron in the Foundry

Mr. George Hall's Paper on "High-Duty Cast Iron in the Foundry," which was read before the West Riding of Yorkshire Branch of the Institute of British Foundrymen,* aroused an interesting discussion.

Mr. H. A. McColl inquired whether, in the case of high-duty silicon irons as mentioned in the Paper, extra patternmaking and contraction allowances had been made. In regard to facing of the moulds, had Mr. Hall tried silica washing as used in steel practice?

Mr. Hall, replying, said, in regard to the pyrometer, he would not contend that these instruments were absolutely accurate, but he had found them near enough, even in the hands of an unskilled man, to serve the purpose. He agreed that, with "Perlit" iron, they must be reasonably reliable to get good results. In regard to patterns, it must, of course, be understood that there should be a contraction allowance. He had not tried silica washing as in steel practice.

Temperature of Cupola Metal

Mr. J. Haigh (Wakefield) said Mr. Hall had not gone into details as to tensile strength and some other figures such as one was accustomed to have mentioned in discussing these matters. He had never come across a disappearing film pyrometer that had been absolutely accurate at the mould, and it may be very unreliable in the hands of an unskilled man. Even experienced men might have difficulty in telling the actual temperature at the mould—he was more concerned with the temperature at the mould than at the cupola. In regard to the addition of nickel, the chief objection was its price. Mr. Haigh said he would be chary of advising anybody to abolish feeder heads.

Elimination of Feeding Heads

Mr. Hall said he did not deal with questions of tensile strength or cost of perlite, because in his Paper he was not discussing the structure of "Perlit" so much as making use of it in the foundry. The reason he took the temperature at the spout was because it was useful to take it there first as a guide. It was taken again as the metal was going into the mould, but if, by taking temperature as it left the cupola, it was found to be other than satisfactory, it could be corrected before it got to the mould. Undoubtedly, the most important place for temperature was at the mould, but the other place as an addition was very helpful. In regard to feeder heads, he was merely pointing out that castings could be made without feeder heads. He was not advocating the general abolition of feeding. Sometimes reduction of feeding was worth while.

Mr. A. S. Worcester (Huddersfield) said his experience was that nickel added at the spout was liable to travel on top of the stream of metal as a kind of scum, and he would emphasise the importance of keeping up an active stirring to make sure it became well mixed with the metal. In regard to reduction or abolition of feeding, Mr. Worcester reminded younger members of the industry that they should not misunderstand what had been said by Mr. Hall in respect of "Perlit," and think they could do without adequate feeding in ordinary iron practice.

Nickel Additions

Mr. Hall agreed that care must be taken to avoid the nickel becoming a scum flowing on top of the metal. The best way, he contended, was to add nickel at the cupola spout. He entirely supported the suggestion that it must be well stirred to ensure a good mixing. In regard to feeder heads, he would not do away with them for ordinary castings, but with "Perlit" it had been done, and he had himself done it.

Mr. F. K. Neath, B.Sc. (Keighley Laboratories), confirmed Mr. Hall's remarks in regard to the question of moulds for the "Perlit" process. There was also something to be said in favour of Mr. Hall's contention in the matter of reducing feeding heads in this particular process. On that very vexed question of the pyrometer, Mr. Neath supported the remarks of Mr. Haigh in that one could not get accurate temperatures of molten metal with an optical pyrometer.

Oil-Sand Cores in "Perlit"

Mr. J. J. Watson (Huddersfield) raised some doubt as to the use of an oil sand in the work as described by Mr. Hall. Was not the hot metal liable to cause trouble by collapsing the core?

Mr. Hall recalled experiments in which this question of collapse of cores arose. If put in a mould, it should be closed, put back in the stove, kept there for some hours—quite a number, within reason—and the cores will stand up. It was definitely proved an oil sand could be used.

In answer to a question by Mr. E. A. Roper as to the size of cupola used by Mr. Hall in the work under discussion, Mr. Hall said the cupola he used was one described as a 3-ton size. One had to experiment a little with one's own water gauge before coming to a definite figure. After trying out this cupola for a few weeks he came to the conclusion that if his water gauge was a 5½ figure his cupola was satisfactory.

Nickel and Porosity

Mr. J. H. Wright (Leeds) said from his own experiences he felt unable to accept the idea that adding nickel was a cure for porosity. He had used nickel up to about 1 per cent. and it had not cured porosity. If nickel would achieve this objective, he would be glad to know what percentage was required.

Mr. Hall replied that for the casting in question he would add anything up to a maximum of 2½ per cent. It may in some cases be desirable to write to the suppliers of nickel asking their advice as to a percentage suitable to the inquirer's particular case. Personally, he was convinced nickel can be made a very valuable help in securing sound castings, though admittedly it may take some adjustment in regard to one's own particular needs.

The President (Mr. Walker), closing the discussion, said adding nickel to the spout was hardly the most desirable method. His own idea was to add a nickel ingot on the top of the coke bed and charge the cupola with the correct amount of iron to the correct mixture. Collect this in a reservoir and run it into pigs, and by this method one had a nickel pig-iron ready to produce castings.

Mr. N. W. Riley (Harrogate) proposed a vote of thanks to Mr. Hall for his Paper.

* Foundry Trade Journal, January 17, 1935, page 57.

Notes from the Branches

EAST MIDLANDS BRANCH

At the annual meeting of the East Midlands Branch of the Institute of British Foundrymen the following officers were elected for the session 1935-36: President, Mr. J. F. Driver, Loughborough; Senior Vice-President, Mr. H. Bunting, Derby; Junior Vice-President, Mr. W. T. Evans, Derby; Honorary Secretary, Mr. B. Gale, Nottingham; Honorary Librarian, Mr. H. Bunting; Auditors, Mr. W. H. Smith and Mr. H. Bunting; elected to the Branch Council, Mr. W. H. Smith, Mr. H. L. Sanders and Mr. R. Spriggs, elected to the Technical Committee, Mr. P. A. Russell and Mr. A. E. Peace; Delegates to General Council, Mr. A. E. Peace, Mr. C. W. Bigg and Mr. H. Bunting.

The Scrap Situation

By "Onlooker."

The recent rally in the prices of copper and spelter has come as something of a relief to the scrap-metal fraternity, for during the period of very low values in virgin metals the situation has been extremely difficult and trading in secondary material far from easy. For the moment the full benefits of the higher quotations are not being felt, for there is an expectation that both copper and zinc are destined to be dearer before many months have passed, and holders of old metals are therefore inclined to hold on to what they have in the hope of netting more profit by waiting. For once they are probably doing the right thing, for the general trend of non-ferrous metal values seems still to be upwards, and if reactions come they are likely to be short lived.

Those scrap-metal dealers who specialised in the importation of American metal have had a pretty thin deal for some time, owing to the fact that the wide spread between the export and home prices in the United States has made it much more profitable for those people holding scrap to dispose of it within the confines of the American tariff-protected market. The recently concluded copper-curtailment pact has, however, changed all that, and with little more than a cent per pound dividing the domestic quotation and the export price there is much less incentive to sell scrap to the refineries in preference to sending it abroad. In consequence both brass and copper have again started to cross the Atlantic, and although values are rather above what buyers in this country are prepared to pay, a start has been made and the situation ought to develop, especially as there is likely to be some scarcity of Bessemer and fire-refined brands as soon as the effects of the curtailment measure begin to make themselves felt.

Undoubtedly the dealers in old metal have an excellent opportunity to regain much of the ground they have lost in past years, but they must not run away with the idea that everything is going to be perfectly plain sailing for them. During the period of acute depression in copper values consumers have been paying up to the hilt for old metal, and margins below virgin metals are still too narrow to enable the foundries to buy freely. This is a matter which scrap merchants must watch very carefully, for, unless they are prepared to co-operate with their customers by getting old metals on to the market at relaitively lower prices than have been ruling for a long time past, the rising markets will benefit them but little.

Reference has been made to the likelihood of an increase in the tonnage of American scrap entering this country, but this improvement will not take place unless the Customs authorities are going to adopt a more reasonable attitude over imports by interpreting the Act which governs taxation of metal goods brought into this country from abroad in a more reasonable manner than they have of late. Importers of brass and copper tubes for re-drawing are particularly concerned in this matter, as recently an additional 10 per cent. *ad valorem* duty has been granted on foreign tubes entering this country, and should the old tubes prove unsuitable for the drawbench the importer has no means of recovering the duty he has paid except by action in the High Court, a course of action hardly likely to commend itself to any merchant house dealing in old metals. Undoubtedly we have in this country a very considerable reservoir of scrap which can be drawn upon, but it is nevertheless important that material should come in freely from abroad, and if H.M. Customs are going to hinder this flow our trade in non-ferrous metals is bound to suffer.

Complex Foundry Problems*

By S. CARTER

The Cupola

To a generation accustomed to progress by leaps and bounds, of the most wonderful achievements of science and invention, it may appear a strange thing that many still consider the cupola, an ancient foundry institution, in the light of a "problem." This fact serves to illustrate the lack of progress and loss of efficiency from which many foundries are suffering. Most founders would be prepared to admit that many of their troubles have their origin inside the cupola, and, even granted ideal conditions, cupola-melted metal is a very variable product. From an economic aspect, it may be that cupolas are a redundant form of melting appliance, but from another angle of the same subject it can be advanced that cupolas represent the cheapest form of melting and that, until cast iron can demand a higher intrinsic value, one of its greatest features must remain its cheapness.

Coke-to-Iron Ratios

Coke-to-iron ratios usually form the criterion of successful or inefficient cupola operation, and one is certainly inclined to feel that, if one's neighbour is obtaining 12 to 1 iron to coke against 8 to 1 in one's own foundry, there is something either radically wrong at home or phenomenally successful across the way. This apparently wide difference in cupola efficiency is generally more apparent than real. It does, however, cause the alert manager to re-investigate every phase of the melting operation, and he may be rewarded by the revelation of some minor detail which has an adverse effect on results. Better still, his existing method may be vindicated. In any foundry operating with any degree of control, coke ratios are in direct relation to the type of casting manufactured and the quality of the coke used. Air supply is, of course, a chief factor, but may be regarded as a stable one, providing the cupola and blast arrangements have been scientifically made at the outset. Taking a hypothetical case of two neighbouring foundries, one of which is engaged entirely on the production of a heavy unmachined type of casting, and the other making high-quality castings to specification and necessarily flawless under test and machining operation, it would obviously be impossible to compare cupola performance on coke-ratio figures alone. Definition of correct cupola practice is confined to the ability to provide metal of a suitable casting temperature, suitable, that is, to the manufactures of any individual foundry, and it could not be a matter for congratulation should one waste coke on obtaining extra-hot iron and afterwards be compelled to waste time waiting for the metal to cool down to a safe casting temperature. On the contrary, some high-quality irons must be tapped at a high degree of superheat and may be well on the way to solidification at the casting temperature of some lower-grade irons; therefore, it will become obvious that comparison by means of figures alone cannot entirely portray the standard of efficiency obtainable. For general engineering casting purposes, however, a ratio of 10:1 iron to coke may be considered really good practice, if the iron produced is clean and hot. Tuyere design and its relation to the size of the cupola is an important factor, influencing to a marked degree the efficiency of operation, and the single row of tuyeres is favoured in the belief that a more stable melting zone is maintained in this manner.

Tuyere ratios vary inversely with the size of the cupola, from 1:5 of cross-sectional bore area in cupolas of 30-in. dia., to 1:7 or 1:8 in very large ones. Their design should be such as to offer the minimum of frictional resistance to the air supply, and reduce velocity commensurate on attaining sufficient pressure to reach the centre of the burden. To this end, tuyeres should be square, or nearly so, at the wind belt, flairing in width and tapering in depth to a larger area at the lining. The height of the tuyeres from the bottom of the furnace regulates the size of bed required, so that, unless metal is to be stored in any quantity, as in such cases where a receiver is not available, this distance should be as small as possible. In general, the coke bed is made up to 18 to 24 in. above the tuyeres, and the first charge made directly on to the bed. "In-between" coke charges should occupy the furnace to a depth of 6 to 8 in., and the weight of iron charges should be proportionate to coke for this depth. Presupposing that air supply was accurate in every cupola and design the same, increasing diameters of furnace would have heavier iron charges in relation, this in spite of figures available of 30-in. furnaces with 15- and even 20-cwt. charges. Should coke quality deteriorate or fresh sources of supply necessitate readjustment, it should be borne in mind that the proper method of procedure is to reduce the weight of the iron charge and not to increase the amount of coke. All these suggestions are ancillary to other, more scientific, methods of determining cupola efficiency, chief among them air measurement, and it cannot be too widely recognised that this factor is the basis of successful practice. It should be possible to say that sufficient air is being passed into the cupola and at the proper velocity to obtain the maximum thermal efficiency without danger of oxidation, and if a slightly reducing blast is used, fairly close control can be obtained. Slag analysis presents a good indication of cupola conditions, and, other things being equal, 5 to 7 per cent. of iron oxide in the assay will represent quite good practice.

Stocking Iron

Another problem of great concern to iron-founders, particularly to the jobbing fraternity whose manufactures extend to all the branches of modern engineering industry, is the necessity of stocking different qualities of irons from which to meet the individual demands of customers. The author's firm, as an instance, supplies castings to at least a dozen different branches of engineering, and the problem of making up mixtures promised to become acute. Several factors had to be taken into account, of which the selling-price factor was not the least; therefore, in considering the adoption of a utility mixture, fancy-price materials, designated "special" by the iron makers, had to be ruled out. Lack of storage accommodation, besides the cost consideration, compelled the management, after careful investigation, to confine their purchases to two brands of pig-iron with which could be blended admixtures of steel scrap or cast scrap in fairly heavy proportions. The two pig-irons chosen were a Scottish high-silicon and a normal No. 3 "Burn" Indian pig. The analyses of these materials were as follow:—

	T.C.	Si.	Mn.	P.	S.
Scottish	3.4	4.5	1.2	0.2	0.05
Burn ..	3.8	2.5	1.2	0.4	0.06

It is generally widely known that the Burn pig is very high in total carbon, but with the steel percentages usually carried it does not reflect itself in the ultimate mixture. Actually, a virgin melt of this pig lost carbon during melting, a fact which very probably indicates a disposition to attain eutectic composition in the contrary manner to which a semi-steel mixture of less than the eutectic would normally attain equilibrium by gradually absorbing carbon in successive melts. At this point it may be advisable to state that, personally, the author has no wish to attain abnormally low total carbon, and he is convinced that for all ordinary purposes 3 per cent. serves equally well, or perhaps better, than 2.8 per cent. C. In regard to the Scottish iron, it is the best utility iron so far encountered, and serves the purpose equally well of carrying large proportions of scrap of high phosphorus content or making up with steel additions for a high-strength mixture. The analysis of a cylinder quality containing 27 per cent. each of Burn and Scottish and 46 per cent. of steel scrap was T.C. 3 per cent., Si 1.5, Mn 0.55, P 0.18 and S 0.09 per cent. Average tensile figures over a period was 16.82 tons per sq. in., and these were accompanied by excellent transverse and deflection results. A very important feature of this class of iron is its relative freedom from porosity or liquid shrinkage, especially having regard to the fairly low total-carbon and silicon contents. The mixture is melted and cast at a higher temperature than is usual for cast iron, and it is not found necessary to allow larger runners, because of this higher pouring temperature. Risers or feeders must be of the self-feeding type, where possible, as rod feeding aggravates the already short freezing range of this material and can cause a certain amount of trouble due to the partially solid material in the head getting pushed down into what may be a machined surface underneath. A peculiar feature of this class of iron is its tendency to sink from the flat as against internal shrinkage, and to counteract this effect flow-off risers of generous proportions are usually attached to thick castings of the bedplate type, even where section is fairly equal, the head pressure counteracting the downward tendency.

It will have become evident from the above that the author belongs to the ranks of the semi-steel fanatics. This is certainly true, and, whilst making no attempt at a disclaimer, he would like to illustrate the principal arguments for and against the use of steel mixtures, with a desire to allay a reluctant personal suspicion in regard to what is termed "inherence." In this latter respect the author has not been able to obtain satisfactory figures of comparison, but, speaking generally, he has yet to be convinced, on evidence, that any two irons of identical composition with the same blast furnace or cupola practice history, will give different results from one another. The steel is produced from hematite and improved mechanically by reducing the impurities in the latter, and if, for example, the very elements taken out during steel practice were reintroduced into the molten steel, one would have hematite again. Upon that fact depends the theory of inhesion, and no one has yet proved satisfactorily in an unambiguous manner that contemporary analyses with the same treatment will produce other than identical results. Proceeding beyond the realms of contention and supposition, personal experience has not led to a belief in the super-properties of all mine irons; at the same time, it is appreciated that it is a distinct assistance to foundrymen to know that their pig-iron has been won from the mines of a particular district in preference to being collected from the dust-bins of the East End of London, more on account of the consistency which may be expected. Nor, on the contrary, is any claim laid to any remarkable effects due to the intrinsic value of the steel in steel mixtures. To illustrate the practical aspect, a comparison of two irons of similar composition, but of different origin, is given overleaf.

No. 1 represents a hematite iron, known as virgin all-mine pig and No. 2 is a similar mixture but with less steel additions to the Burn/Scottish/steel previously detailed.

It has been stated by some authorities that steel-iron mixtures show heterogeneity associated with hard spots and infer that this effect is in

* A Paper read before the West Riding Branch of the Institute of British Foundrymen, Mr. A. W. Walker presiding.

XUM

some obscure manner due to the presence of the steel, as steel, which exists separately in the melt or at all events separates out as such. The fact that hard spots do sometimes occur in semi-steel castings has been pounced upon by interested parties to show that this method is useless and the more the mixture costs the better it will be. No mention is ever made in this connection of faulty cupola practice, and this is the sole cause of hard spots. After the first short period when experience had to be gained, there has not been, during a period of 10 years subsequently, a defective casting due to this trouble. Fletcher, in a Paper to the Staffordshire Iron and Steel Institute in 1930, said "It requires but little argument to prove that metal of homogeneous structure in the molten condition is less likely to freeze irregularly than when the metal is a confused mixture of 'steely' (high-contraction type) metal and highly siliceous (low contraction) iron." Why it should be inferred that the molten condition of semi-steel mixtures properly melted should be any less homogeneous than any other iron mixture remains a mystery to the foundryman.

	T.C.	Si.	Mn.	P.	S.
No. 1 ..	3.85	1.42	0.75	0.04	0.04
No. 2 ..	3.32	1.61	0.76	0.18	0.07

	Physical properties.	Tensile, tons per sq. in.	Trans. Mod. of rupture.
No. 1 ..	—	14.8	28 tons
No. 2 ..	—	16.7	32 ,,

Sand has probably received more than its due allowance of publicity during the current session mainly on account of the opening meeting when Mr. Sheehan's classic Paper was discussed and a further more practical recent lecture by Mr. Griffiths, of English Electric Company. Both these Papers were of outstanding merit and were the sequel to a high standard of practice which existed in their respective foundries, the one representative of a great advance in the science of sand control, the other illustrating the excellent results obtainable from the use and efficient preparation of one particular type of sand. While not intending to criticise in any way the excellence of those efforts, it is considered that from the standpoint of the majority of practical foundrymen, their full value was negatived by the absence of data affecting cost considerations. Everyone seemed to realise that scientific sand control entailed expensive sand treatment and handling plant without, however, realising that savings are to be obtained in the cost of materials. The provision of this special plant is not within the means of the majority, but by a constructive use of the data that has been obtained excellent results may be achieved as far as sand costs are concerned. With the object of simple illustration and with the valuable co-operation of Mr. Walker, a series of experiments on sands of standard quality that were used in the locality were carried out. The tests were made on unmilled samples and were intended to show the disparity in the properties of green-bond strength and permeability in two local sands. Before discussing the results obtained, it may be advantageous to discover if, and why, any particular sand has preference in the locality. This district is notable for the excellence of its product in green sand, and so attention must first be given to the properties which are necessary to attain this high degree of excellence. A sand which is familiar locally appears to find most favour, chiefly due to its low first cost and its comparative coarse grain and low bonding medium. These factors are held to be the reason for its extended use in green-sand work, but after considerable testing and experiments the author has been unable to find any justification for its continued use beyond the single fact that most West Riding moulders are familiar with it and have therefore acquired a certain experience of its idiosyncrasies that has helped to place a false value on its merits for green-sand work. The sand itself is deficient in bonding strength, is only moderately graded, but possesses a fairly high degree of permeability. Milling produces but little increase in strength with the result that large quantities are used daily in facing sands to produce an effect that could be better obtained by less than half the quantity of a more heavily bonded sand. But, it may be said, heavily bonded sands are close and relatively impermeable, leading to trouble with the castings. Some are, of course, definitely unsuitable for green-sand work of a heavy nature, but there is a sand in existence that possesses nearly double the permeability of this local sand and five times its green-bond strength. Moreover, it is more highly refractory and has a longer life. Cost is not the all-important item if one refers to first cost as will be understood after examination of the following figures.

Sand.	Moisture content.	G.B.S.	Permeability.
A	5.6	14.30	136
B	8.0	2.80	65
C	6.0	11.10	39.7
D	6.0	4.5	38

The prices of the materials may be assumed to be respectively 25s., 12s., 18s. and 19s. per ton. From the green-bond strength figures it will be seen that A is equal to five times the amount of B; also, as its permeability is substantially higher, less new sand additions would produce an equal or better effect in sand renovation. From tests made it appears that 15 per cent. of A produces an effect on facing sand equal to 50 per cent. of B, and, furthermore, it is thought that the general condition of the backing sand would be more improved by 15 per cent. A than by 50 per cent. B, due to the higher refractory value and beautifully-graded sand grains. Apart, then, from any actual saving, the use of A sand against B, or for that matter any other sand so far handled, is cumulative in all respects. Supposing the previous figures to be correct, a foundry purchasing 500 tons of B sand annually at 12s. per ton would bear a cost of £300. In the ratio 50:15 150 tons A would supplant the B tonnage so that first cost would be represented by 150 tons at 25s. = £187 10s. This saving would be on first cost alone and takes no account of the saving obtained by the handling of such a greatly reduced tonnage. Sand A is very well known to steel-founders, and this fact alone should testify to its excellent refractory properties. The sand is built up from a base material and clay is added to requisite strength thereby in some measure conforming to the true designation of the word synthetic. The price per ton, of course, alarms the foundryman initially, but this extra cost is more than covered by results and the use of smaller quantities. Very brief mention of the two sands C and D will be made because they represent the means as distinct from the extremes of the two previously-mentioned sands. C is probably the least familiar to local founders, but it is a sand deservedly popular on small and repetition work, beautifully graded in grain size and carries varying amounts of bond very tenaciously. It produces a good skin on light castings very similar to D, but holds an advantage over the latter in regard to grading and green-bond strength. For brassfounding, however, D still retains its supremacy.

Coal-Dust Experiments

Closely following the sand experiments it was decided to test the effect of different grists of coal dust on the permeability of the sand. For purposes of demonstration extreme measures were taken and 20 per cent. coal-dust additions were made to the most permeable sand. Coarse coal dust was added, and it was noted that permeability increased from 136 to 146 on account of the larger size coal dust further opening up the test-piece. Green-bond strength figures, as expected, were down to 10¾ lbs. from the previous test of 14.3 lbs. For further experiments the same sand and initial values were used and 20 per cent. additions of finer-grade coal dusts made until with a 20 per cent. addition of superfine coal dust the permeability figure dropped from 136 to 23. This demonstration was startling and confirmed both Mr. Walker, who was present, and the author, in the belief that superfine coal dust was definitely detrimental to the sand value in a jobbing foundry. Green-bond strength in this latter experiment was nearly equal to that of the sand alone, being nearly 13½ lbs. The chief factors emanating from the results were the reduction in green-bond strength of the sand with coarse coal dust and the maintenance of permeability, and the amazing drop in permeability in the superfine sample. Probably the drop in strength of the sand with the coarser coal dust is due to the weakening action of the large particles of coal which form cleavage planes very similar to those of graphite formation in iron. Conversely, the drop in permeability indicates clogging of the pores of the sand by coal dust of very fine grade. The obvious remedy is to include coal dust only in accordance with the average grain size of the sand with which it must be incorporated.

Heavy Sections and Small Cores

Approaching nearer to the practical aspect of moulding, it is proposed to deal with some difficulties experienced in obtaining sound castings where heavy sections are adjacent to small cores. Taking, for example, a small boss casting for a wheel hub which has swellings around its centre for fitting in the wrought-iron spokes. The boss diameter in its smallest part is 6 in. and in its largest 10 in. The bore is 1⅝ in. dia. necessitating 1⅜-in. dia. hole, this and the length of the boss on each side of the spoke part is 4 in., making the overall depth of the job 11 in. The original method of making these castings was to run at the joint into the thick section and take off a riser at the top down which a feeding rod was used to feed the casting solid. This method produced very indifferent results and an attempt was made to cast the moulds on the pencil runner principle, but hollow places were encountered in the bore in the centre of the casting. This method was used in conjunction with a heavy self-feeding riser, but even then the sunken place in the bore persisted. Denseners were then tried in the form of tapered cast-iron circular cores, but owing to the length of the bore and the small margin allowed for machining, difficulty was experienced in getting the chills out when cold, besides which the size of the chill was insufficient to counteract the shrinkage entirely, as slight cracks still showed down the bore. These castings are not yet being produced perfectly sound, although the present method of using a 1-in. dia. straight rod of steel baked in core sand to give the proper diameter has achieved the greatest measure of success so far. Other methods which have been tried were in one instance a hollow tube of 1 in. dia. prepared as before, on the principle that quicker conduction of the gases may help to improve soundness or at least remove the hot spot from the bore, and cores made up of iron borings and sand. Various metal compositions have been tried without avail, and it would be interesting to learn from anyone who has successfully overcome similar difficulties or are interested in the problem.

Foundry work is hailed as having attained a new era in scientific control, but the industry is far behind the other branches of engineering both in progress and organisation. This state of affairs to a normally healthy and ambitious young foundryman could be the cause of endeavour and enthusiasm to place things on a higher level, but the hide-bound conservatism of many foundries stifles ambition and results in a relapse into orthodoxy. The foundry, particularly if it is old established, is fettered by shackles of tradition which in extreme circumstances is given authority over reason. Tradition

gives a certain grace to established usages and mellows the surroundings of its abode, but where it becomes a veto on individuality of expression and experiment and progress one must preserve the utmost vigilance and opposition. To the ranks of the employer or manager an appeal is made to give the young man a chance, and if his brains are worth buying, let him exercise them in the direction in which they will be most fertile and therefore most profitable. Encourage his individuality and his unorthodox methods and cease to chafe because he can and will use spade-work as a stepping stone to provide the same service himself to the next generation.

In conclusion, the author thanked Mr. Walker for the assistance and advice he had rendered and Mr. Worcester for his kind permission to use the data included in this Paper.

DISCUSSION

Opening the discussion, Mr. R. D. Welford said he would be interested to know whether Mr. Carter had based his air input into the cupola on the amount of iron he put in or on the amount of coke used. Did Mr. Carter consider the lack of lining standing up was the result of the material or of the air pressures going into the furnace? The fault with many cupola men was that they would not take the trouble to chip the slag off the lining. Mr. Welford felt it was hardly possible to specify a precise mixture of sand which would be ideal to everybody, and foundrymen had to get the best available suitable to their own particular work, be it light or heavy. It was, of course, easy to appreciate that a large quantity of very fine coal dust was liable to cause clogging. The percentage of coal dust must, he felt, vary according to one's own experience and the purpose in view.

Mr. Carter, in answer to the question on air supply, said his (Mr. Carter's) statement had been based on the coke input. In regard to the sand question, he had intended to emphasise that the sand A was a better sand under all conditions.

Mr. E. Roper (Keighley), referring to the cupola, said Mr. Carter had made a good point in showing that a precise melting zone was a good thing at which to aim. In regard to coke quantity and higher temperature, a controlled mixture of air and coke gave a higher temperature.

Coke Ratios

Mr. F. K. Neath, B.Sc. (Keighley), said that he was often inclined to question the authenticity of figures given in relation to coke ratio. In giving figures on this matter the foundryman making the claim was not always considering the job as a whole, as, of course, he should do. Some people had a deep bed and shallow charges, and thought they were getting really good efficiency all round over the whole of the melt. In regard to slag analysis, had Mr. Carter ever measured and weighed the total amount of slag he had had during the melt? Much, said Mr. Neath, depended on how many tons of slag one had after the melt, and what was the iron-oxide content. The quantity of slag, he suggested, was as important as the chemical composition. The only way one could get the total carbon down in many cases was by the use of some steel, especially with low-phosphorus mixtures in which the total carbon tended to rise very rapidly. Mr. Neath said he would be interested to know how much steel Mr. Carter had used to get his 3 per cent. of total carbon. Mr. Neath (continuing) said he was no advocate of rod feeding. He had seen many cases in which much trouble had been caused by rod feeding. He wished all good luck to Mr. Carter in trying to explode the "inherent properties" theory. What were the inherent properties of cast iron? So far as he knew there was only the roller trade which believed in them now, and to judge from their lack of publicity, that belief might be due to ignorance. Mr. Neath, in conclusion, endorsed Mr. Carter's advocacy, supported by figures, as to the value and importance of sand control, and remarked that there was no doubt that this was one of the most vitally important matters in foundry practice to-day.

Replying to Mr. Neath, Mr. Carter said the coke ratios to which he had referred were the overall consumption. In answer to the question as to steel and total carbon, Mr. Carter said 40 per cent. would be the minimum. In regard to rod feeding, Mr. Carter agreed there was much of it done unnecessarily, but suggested there were occasions on which one could not very well do without some rod feeding to reach down to where one wanted to get, and he did not think the industry could entirely do away with it.

Mr. G. Hall (Shipley) said it might be true that one got hotter iron with 12½ per cent. coke than with 10 per cent., but there should, he thought, be no need to use that amount in any well-controlled cupola. The extra heat depended chiefly on the air mixture and one could, he felt, usually get an equivalent result with about 8 per cent. of coke.

Steel Mixtures and Shrinkage

Mr. W. Fearnside (Keighley) said he was ready to declare at once he had no use for steel in cast iron. To his mind it increased the shrinkage. In regard to rod feeding, he believed there were more wasters with such feeding, especially when applied carelessly, than without it. With a proper composition of metal and a good sound feeding head, that should keep the metal liquid so long as possible, and therefore let the melt feed itself, there was no need for rod feeding.

Mr. Carter said he was not prepared to admit semi-steel involved more shrinkage. If it were possible to get more tensile strength by a higher total carbon, one would not go to the trouble of using steel.

Rod Feeding

Mr. H. Holdsworth (Denton) said that rod feeding could be useful if applied by a man who knew how to do it. Competition to-day rested largely on price, and they had to consider that factor.

Mr. Welford remarked that the discussion on rod feeding brought one to the point of asking what really was the function of rod feeding? His own idea was that it was simply to keep an opening to let the metal get down, and not to push the metal down; but there were men who regarded the latter as the primary faction, and that, he thought, was where some of the trouble arose.

Mr. Neath said that he was convinced that there was much rod feeding done merely by force of habit, whereas the desired effect could be secured by better means and give a sounder casting.

Mr. Carter, replying to Mr. Holdworth's point on cost, said that in quoting for jobs, of course, all questions of process for a good job should be taken into consideration, and any idea of putting in any poor type of material to meet competitive prices simply tended to create false values.

Mr. H. Bradbury (Huddersfield) felt that in regard to feeding, if the fresh metal was put in extremely hot there would be better results.

Mr. H. Wright (Leeds), speaking in regard to the use of steel, asked if Mr. Carter had ever found trouble from a certain amount of slag coming up in the casting as a result.

Mr. Carter said that there was no more likelihood than in the case of ordinary cast iron.

Choice of Steel for Steel Mixtures

Mr. A. S. Worcester (Huddersfield) said it must always be remembered that much depended on the human element operating any process or any method. It was desirable to take records of the blast, and it was well to remember that a semi-steel mixture did not mean the use of low-grade material such as tin cans. Steel mixtures could easily stand condemned because they were low in carbon and low in phosphorus, and they should be run quickly and hot. Mr. Worcester said he had been a little surprised by Mr. Carter's contention that coal-dust size should be as big as the sand grains. With some sands he imagined that would be quite difficult sometimes. In regard to slag, it was true that the weight of slag was an important factor, but it would vary with the nature of the material charged.

Mr. Carter, replying to Mr. Worcester's doubt about size of coal grit, pointed to the display of sand and coal dust on the bench, as showing that it was quite practicable to match coal-dust grit to sand-grain size.

The Chairman (Mr. Walker) said that in his opinion no two cupolas would work exactly alike and at the best one had to deal with one's own cupola, to a large extent, as one found it.

Mr. H. Coggan (Halifax) proposed a vote of thanks to Mr. Carter, which Mr. S. W. Wise (Bradford) seconded.

Commercial Moulding Sand Control for the Tyneside Founder

(*Continued from page* 265.)

dry sand in order to counteract the effect of drying cracks, but in regard to permeability no loam produced can be classed as permeable, and this factor is of minor account. What does matter is to ensure that the gas evolved on casting is *as low as possible* and that all loam jobs *are thoroughly dry*. Accordingly, all gas-forming materials should be religiously excluded from loam mixtures. Samples of facing loam privately collected during the past few months from Tyneside and Clydeside foundries show the following physical properties:—Moisture percentage, 18.0 to 22.5; dried compression strength A.F.A., lbs. per sq. in., 144.0 to 278.8; dried permeability A.F.A. number, 0.16 to 1.0.

These properties can be satisfactorily met by the use of the dry-sand facing mixture previously given, tempered down to the required moisture content, and there is no need to make up a special loam mixture and so increase the difficulties of obtaining satisfactory sand control by preventing standardisation.

Building Loam

In regard to building loam and loam used for the manufacture of loam bricks, the dried compression strength has been found to be around 100 lbs. per sq. in., and this can usually be obtained in a loam made from 100 per cent. dry-sand floor sand. Very closely associated with the properties of loam is the question of fireclay bricks used for building purposes, and the importance of using a suitable grade of brick is not so fully appreciated as it might be. A survey has recently been made of the bricks available in the Glasgow district, and the results obtained are shown in Table I. The variation in properties is appreciable. Particular note should be made of the moisture absorbed by immersing a dry brick in water. A brick having a high degree of water absorption considerably facilitates the work of the practical loam moulder by rapidly absorbing moisture from the loam and so increasing adhesion and drying.

Table I.—*Properties of Firebrick for Mould Building.*

	Permeability A.F.A. No. (using funnel and rubber washer).	Moisture absorbed by immersing brick (dry) in water for ½ hr.	Compression strength.
		Ozs. per cu. in.	Lbs. per sq. in.
From	0.11	0.051	665
To	39.56	0.342	4,360
Satisfactory properties	39.56	0.155	1,080

(*To be concluded.*)

London Foundrymen Elect New Officers

MR. F. O. BLACKWELL TO BE PRESIDENT

The annual general meeting of the London Branch of the Institute of British Foundrymen was held at Charing Cross Hotel, London, W.C.2, on Wednesday, April 3, 1935, with the Branch-President (Mr. A. S. Beech) in the chair. The minutes of the preceding annual general meeting were taken as read and were confirmed and signed.

Secretary's Report

The Report of the hon. secretary, Mr. H. W. Lockwood, on the work of the session was as follows:—

Mr. Chairman and Gentlemen,—The session which closes with our meeting to-night has witnessed the consolidation of the prosperity of the foundry industry following the revival in trade which was becoming increasingly evident during the preceding session. This prosperity is reflected in the Institute and in this London Branch. We are stronger financially than we have ever been. Our numbers may be slightly under the best on record, but this is due to the deliberate action of the Council in enforcing the rules relating to overdue subscriptions having regard, of course, to any special cases of hardship. As a result the membership list is healthier and, therefore, stronger than it has ever been in the history of the Branch.

Our membership to-day is 229 compared with 228 at this time last year, and is made up as follows:—Subscribing firms, 5; members, 144; Associate members, 73, and Associates, 7. Thirty-four new members were enrolled during this session as against 32 in the preceding year.

During the session a number of Papers have been given on widely diverse subjects and a noticeable feature of our meetings has been the increased interest shown by members, judging by the length of the discussions on Papers.

At the Annual Conference the Branch was honoured by the award of the Oliver Stubbs Medal to one of its members, Mr. V. C. Faulkner, who is a Past-President of the Branch and of the Institute. A further honour was the award of three diplomas for Papers read before the London Branch, of which two were given by our own members, Dr. A. B. Everest and Mr. G. L. Bailey.

An experiment was carried out in November, when we invited members of the East Midlands Branch to join us at a conference in London. It was a complete success, and the good will which was engendered amongst members of both Branches as a result of the conference is a happy omen for the future solidarity and unity of the Institute. The London Branch Council intends to make these inter-Branch conferences a feature of each ensuing session.

Members of the Institute of Metals were our guests at a joint meeting in December last, when Mr. Wesley Lambert, C.B.E., delivered an excellent Paper on "Manganese Bronze."

The annual dinner, also held in December, was well attended, the principal guest on that occasion being Sir Berkeley Sheffield, Bt.

In conclusion, I should like to express to the chairman, and to the Council and members of the Branch, my appreciation of their kindly co-operation with me in the working of the Branch and to assure them, with all sincerity, that I regard it as a privilege to be able to render some small service to this Institute, which does so much to apply science to industry, and thus enrich the lives of all of us.

On the motion of Mr. V. Delport (Branch-Vice-President), seconded by Mr. H. O. Slater (Past Branch-President), the report was unanimously adopted.

The Branch-President expressed thanks to Mr. Lockwood for a further wonderful display of enthusiasm and energy during the past session. He informed all who had aspirations to the Branch presidency that, so long as Mr. Lockwood filled the office of hon. secretary, they need have no fear; he would pilot them through all the rocks and bring them safely into harbour.

Election of Officers and Council

The following officers and members of Council were elected to serve for the year 1935-36:—

Branch-President.—Mr. F. O. Blackwell.

Branch Senior Vice-President.—Mr. V. Delport.

Branch Junior Vice-President.—Dr. A. B. Everest.

Members of Council.—Mr. F. J. Cree, Mr. C. C. Booth and Mr. A. C. Turner, having retired by rotation, were re-elected. Mr. A. J. Murphy was elected to fill the vacancy due to Dr. Everest's elevation to the vice-presidency.

Hon. Secretary.—Mr. H. W. Lockwood.

Hon. Auditors.—Mr. A. R. Bartlett and Mr. C. Cleaver.

Delegates to General Council.—Mr. A. S. Beech and Mr. C. H. Kain.

Representatives on Technical Committee.—Mr. Wesley Lambert, C.B.E., and Mr. C. H. Kain.

Vote of Thanks to the Hon. Secretary

Mr. V. Delport proposed a vote of thanks to Mr. Lockwood for his services as hon. secretary during the past year, and commented that one would wish that he could be re-elected to that office, not for one year, but for at least five. As an officer of the Branch, Mr. Delport appreciated fully the great amount of work which the hon. secretary had to do, and which he did not think was realised by many of the members. It was a fact that the Branch relied to a very great extent upon the work of the hon. secretary, and there was no one more fitted for the post than Mr. Lockwood.

Mr. Lake, seconding, also emphasised the first-class manner in which Mr. Lockwood carried out his duties, and remarked that if every Branch had as good an hon. secretary things would run very much more smoothly.

The vote of thanks was carried with acclamation.

Mr. Lockwood, in his response, assured the members that the work was a pleasure to him; he was quite sincere in saying that he liked the work, and he felt that he was able to do a little to help in the application of science to industry, which meant so much to all of them.

Short Paper Competition

Four short Papers were submitted for competition, dealing with various aspects of the foundry industry. The Papers were submitted by members anonymously, the only restriction being that the length of any one of them should not exceed one thousand words. The Papers were read by Dr. A. B. Everest and at the conclusion the members decided by ballot the best Paper, a prize being offered by Mr. W. B. Lake, J.P. (which took the form of a cheque), to the author of the selected Paper.

The titles of the Papers submitted were as follow:—

1. "The Foundry in Engineering."
2. "A New Foundry Product."
3. "Is the Southern Foundry Owner Handicapped?"
4. "What of the Future Tradesman?"

The Paper which was selected by members as the best was as follows:—

"WHAT OF THE FUTURE TRADESMAN?"

By F. Gentles.

During the period of the appreciable trade recovery following the slump of 1930-31, many engineering firms found themselves without sufficient competent tradesmen to keep pace with the demands for their products. Particularly true was this of the heavy industries, but fairly general in all branches. This may be argued as being due to various causes, but in the main it was largely due to the absence of a regular flow of recruits to the industries concerned.

The foundry industry of this country was in a worse position, for, while the automatic machine in its various forms has steadily been developed over a comparatively long number of years, in the foundry mechanised plants have really shown the same measure of progress only during the last ten years. As a result of this, there has grown up among certain men in executive positions in the trade a mental attitude that founders were not required to concern themselves unduly with the training of boys for the foundry industry of the future—the machine would see them through. It is because the author heartily disagrees with this attitude that he took the opportunity which this competition gave of anonymity of raising the question of apprentice training in the shops, in order that some opinions may be expressed which would lead to discussion and help to create a definite line of policy and development where there is little, if any, guidance for the men who are trying to fill executive positions with honesty both to themselves and to the trade.

The author is fully conscious of what has been done, and is being done, in the way of providing facilities and opportunities for the brighter lads in the way of national certificates, etc., but it is not the bright lads who will in the future become foundry executives, but rather the average lads who enter the trade and who will become the tradesmen of to-morrow. It is generally admitted by most foundrymen in executive positions that it is becoming more difficult every year to find good tradesmen—and this applies to the light-castings trade as well as to the engineering side, and to the non-ferrous as well as to the ferrous industry.

Now, in addition to stating the difficulties in getting the proper type of good tradesmen, many questions naturally arise. These may be summarised briefly:—(*a*) What are we doing to help the position in the very near future? (*b*) What can members do as individuals at Institute meetings and in their own daily duties and concerns? (*c*) What part can the Institute play in helping to get the question of improved methods of practical systematic training brought about?

In dealing with (*a*), it must be admitted that, while a few of the more progressive executives and firms have done a good deal to improve the training, it does remain certain that in most cases apprentice lads are generally left "to hang as they grow." True, in many cases, we have segregated the lads and left someone to keep a weather eye on them; but for real teaching of the trade and the elements of discipline the results leave much to be desired. As for (*b*) and (*c*), by exchanging opinions and viewpoints and trying to get personal ideas adopted and criticised, both in the shops and at meetings, one may contribute his quota to the formulation of a common policy which will, in the end, provide better tradesmen.

It must not be forgotten that the world is governed by economic conditions, and that any suggestions or proposals made are most likely to be looked at—by most managements—from this point of view. But it may be argued that, if industry provides the proper men and practical training ground to ensure good skilled men in the future, it is creating an investment which will pay good returns. This question should be

looked at not as an on-cost charge to be grudgingly borne for the present, but as an excellent yield for the future.

One can only touch on the various aspects in a short Paper like this, and there remain the practical questions to be answered:—(*d*) What is the industry doing with its lads just now? (*e*) Are there any changes it could make to improve the position for the near future? (*f*) Are the lads being trained under the best men available for the job? (*g*) What, finally, is it aiming at in the employment of its lads—is it primarily present production, without regard to the future?

It is probably recognised on all sides that great progress has been, and still can be, made with the production of castings on machines, but it is questionable whether there is the same recognition that there always will remain a great many castings which will require skilled men in the future, which for many and varied reasons remain an individual moulder's proposition.

DISCUSSION

Mr. Gentles' Paper was submitted to discussion.

Mr. H. W. Lockwood (Branch hon. secretary), dealing with the author's query as to what the Institute had done to help the younger members of the industry, emphasised that the Institute's rules had recently been altered to admit students in a new category of membership. He suggested that that answered the question as to what the Institute was doing to help the younger members of the industry.

Mr. C. H. Kain (Past-Branch-President) emphasised that the subject of the Paper was one of vital importance, but was one that was being shelved. He believed that the training of future foundry executives was very well looked after by the various training schemes that were in hand nowadays; the training schemes and examinations by the City and Guilds Institute and various other such bodies would very definitely provide well-trained managers, chemists, metallurgists, and so on. The great problem was to find skilled craftsmen, moulders who could work on the floor, and good foremen who could take material from stores and make good castings with it; such men were very rare. Although the problem was very difficult to-day, he feared that ten years hence it would be even worse. One of the causes seemed to be the decline of the apprenticeship system, which appeared to have become absolutely dead. He had made considerable inquiries and could not see any real reason why apprenticeship should cease, unless it were the chaotic conditions which had prevailed during the war, when youths who could do any sort of work could obtain magnificent wages for it.

Mr. A. R. Bartlett (Past-Branch-President) emphasised the grave difficulties facing the practical foundryman, who was in charge of a shop producing really large castings, in getting trained men. One heard of the power of the moulding machine, he said, but the machine could not fill the bill when it came to the production of very large and heavy castings, which demanded a very high degree of skill. There was no machine big enough for such castings; further, each job was usually non-repetitive. As the author of the Paper had pointed out, one had to consider the training, not so much of the exceptionally bright boy, but of the average boys, who would make the future craftsmen. In Mr. Bartlett's district the boys came in at the age of 14 years. The great difficulty in getting the boys in the first place was the mentality of the parents, who seemed to be chiefly concerned with the boys' maximum wage-earning power, and how much they could contribute to the family exchequer. In order to combat that, Mr. Bartlett's company had recently increased the wages offered to boys of 14 years. In order to encourage the boys to take a serious interest in the work, they had evolved a scheme whereby the boys came in at the age of 14 years as probationer apprentices. During a period of two years as a probationer apprentice, the lad would have the opportunity to decide whether he wished to go on, and the employers could take note of the boy's work during those two years in order to decide whether he had the adaptability for a future craftsman. At the age of 16 years he was indentured, and the employers considered whether he was better fitted to become a coremaker, a sand moulder, a loam moulder or anything else in the foundry; and, if he and his parents were willing, he was apprenticed accordingly, and they signed an agreement.

In Mr. Bartlett's experience, it was becoming increasingly difficult, especially since there had been more business, to secure skilled craftsmen. He had had to visit the North-East Coast, and even Scotland and Wales, in search of craftsmen, some of whom had done no work in the trade for the last four or five years. It had been utterly impossible to secure young men in his own neighbourhood who were able to do the work. The men secured from districts 300 or 400 miles away, and who had not worked in the trade for four or five years, had difficulty in picking up their lack of knowledge—not lost knowledge—and they were slower for the time being. The very best men in his works were those who had been trained there from apprentices, and the company always tried to keep them. Turbine and similar work called for very accurate moulding, and very definite dimensions. It was becoming increasingly difficult to find men who could read a drawing properly, who could mark out a job, place the loose pieces in their proper positions, and who could be sure that the casting would be a replica of the drawing. He had about eight boys between the ages of 14 and 16 years, and who appeared to be quite bright, placed with some of his finest craftsmen. In the first place, they worked for a period with the coremakers, making small cores, to give them a sort of atmosphere; then they went with the coremakers who were making medium-sized cores, and after that they went to the sand floor. When they started work on the floor, they always went first to the sand moulder. Mr. Bartlett emphasised the importance of placing these boys under the care of selected craftsmen, rather than giving them jobs to do themselves and leaving them to get on with those jobs as best they could; under this latter procedure the boys would produce many wasters, and they did not learn anything. Latterly, the company had had no difficulty in securing the approval of parents to this apprenticeship system, and the company found that when the boys reached the age of 21, most of them were well worth keeping. The very best craftsmen in the foundry there were those who started work in that foundry 30 or 40 years ago.

Mr. J. A. Smeeton remarked that the smaller foundries did not appear to experience any real lack of craftsmen, perhaps because in country places there was not such a great attraction in having so much money as there was in the south; he imagined that the shortage of craftsmen was greater in the South of England than in the provinces.

Mr. A. J. Murphy said that we were gradually getting a closer view of a very big movement. When there was a depression, labour was in excess of requirements; presumably the status of labour fell, and certainly the average rates of pay fell. When prosperity returned, labour became more valuable and inevitably commanded higher pay and that higher pay constituted one of the most potent attractions into any trade, profession or business. But there would be a time lag, and they were experiencing that time lag. Men were displaced through shrinkage of business and found other work to do, or if they were in a badly-placed district, they did not find other work, and they did not get practice in their own trade. Mr. Murphy was inclined to take a pessimistic view in the sense that there was very little that one could do by personal effort; they had largely to wait and watch the economic forces working slowly in their own way. It seemed that the position was different in other places in the country than in London, because in these other districts very largely the local tradition of craft still prevailed. In London that was not so, because for one thing the foundry industry had come to London largely in very recent years. In the Midlands, for example, there were towns which had depended very largely on the foundry industry for generations, and in such towns there must be a pride in, or a natural tendency to take up, the trade. It appeared likely that in London the attraction of young fellows into the trade would be governed more directly by monetary conditions than was the case in provincial districts. Whilst the Institute could make every effort to increase the status of the foundrymen in every way and to attract the intelligent men into the profession ultimately, the biggest movement must await the development of economic forces along their own lines.

Mr. V. Delport (Branch-Vice-President), commenting upon the use of machinery, said we must accept the fact that machinery had come to stay and would probably develop further. Leaving aside the question of wages, it would be agreed that whereas in the past in the training of the skilled moulder all moulds were made by hand, and it was necessary to have a considerable amount of training over a considerable number of years, nowadays many moulds were made by machine, and he suggested that the standard of training for that type of moulding was not so high as that required for hand moulding, nor was the training so difficult. Under modern conditions of production they had new problems to face and solve. Were there the same opportunities to-day for training skilled craftsmen (who used to be called artisans) that there had been in the past, and had they not to visualise the problem and solve it from that point of view?

Mr. H. O. Slater (Past-Branch-President), said the main cause of lack of skilled tradesmen to-day was the decline of the apprenticeship system, and he agreed with Mr. Kain that there was something in status. A body such as the Institute of British Foundrymen could not teach foundry work. All it could do was to inspire a man and aid him in the technical part of his work; once it gave him that inspiration, and once he obtained the grasp and the spirit of the trade, one need not fear.

Mr. J. N. Burns would not agree that the foundries were the Cinderellas of the trade, but fancied only that the foundrymen considered themselves to be Cinderellas. Their problems were difficult, but so were the problems of other branches of industry, and the foundrymen had lagged behind development in the engineering trade. There had been discussions before the Institute on special alloys, and so on, and the members had agreed that the foundry trade had a big future if those in it would only develop it. The word "Cinderella" should be forgotten.

Mr. J. A. Smeeton, commenting on the desire expressed by some speakers that the Institute should be a body as much for the workmen as for anyone else, said that he was no snob, but he feared that the men would never join in any discussion at any meeting attended by the employers. He wondered if it would be possible or conceivable for the Institute to have two kinds of Branches, in one of which the moulders, the operators of the machines and of the cupola, etc., who did the practical work in the foundry, could air their troubles and ideas.

Mr. F. O. Blackwell (Branch-President-Elect) feared that Mr. Smeeton had not had much experience of endeavouring to persuade the men to attend a meeting at night in order to benefit their own craftsmanship or anything else. That was one of the most heartbreaking tasks he

personally had ever tackled. In connection with the running of a safety-first association in Luton, to deal with the prevention of accidents which might result in the loss of limbs or even of lives, it had been most difficult to persuade a reasonable number of men from the firms in Luton and district to attend meetings, although admirable Papers were presented by representatives of the Home Office.

Author's Reply

Mr. Gentles replied to the discussion. He emphasised in the first place that he was not by any means throwing bricks at the Institute with regard to what it had done or might do. What he had asked for was the co-operation of the men in the Institute in overcoming the present difficulties.

He was not blind to the economics of the problem, but the discussion did reveal that the bulk of the members were alive to the difficulties of getting the tradesman. His concern was to make provision for the future. During the last 15 years he had had a great deal to do with the training of apprentices; he had tried all sorts of things and had been moderately successful. He had had a good deal of experience in jobbing foundries; there were one or two jobbing foundries within his knowledge that were mechanised, but the problem of training craftsmen for the future was still as great in those foundries as in those which were not mechanised. The spirit to which Mr. Slater had referred was just what he was searching for. He believed there were many men connected with the Institute who had sufficient driving force to be able to give a lead, and he believed Mr. Blackwell was right in pointing out that if the prospects of boys who entered the industry were brightened, the industry would be in no danger in the future.

Votes of Thanks

On the motion of Mr. Burns, seconded by Mr. F. J. Cree, a hearty vote of thanks was accorded those who had submitted Papers.

A vote of thanks was proposed by the Branch-President to Mr. Lake for his kindness and generosity in presenting a prize for the best Paper, and he commented upon his tremendous enthusiasm and kindness on all occasions.

Mr. Murphy seconded, and said that Mr. Lake must have been very gratified by the very interesting Papers and discussion.

The vote of thanks was carried with acclamation.

Mr. Lake, responding, said that the discussion had been one of the most interesting and useful that he had heard for some time, because it concerned a question which was vital to all the industry. It had been valuable to hear opinions of people who had such real experience of the problem, and he was grateful to Mr. Gentles for having raised the subject.

On the motion of Mr. C. H. Kain, seconded by Mr. V. Delport, a vote of thanks was accorded Dr. Everest for having read the Papers in a very impersonal manner, and for the manner in which he had preserved the anonymity of the authors.

Mr. A. R. Bartlett (Past-Branch-President) proposed a hearty vote of thanks to Mr. Beech for his service to the Branch as President during the past year—a proposal which it was a privilege to make, as well as a bounden duty.

Mr. H. O. Slater (Past-Branch-President), who seconded, said that, having occupied the Presidential chair in the past, he appreciated the heavy responsibilities. Although Mr. Beech had truly said that the work was rendered easier when one was served by a good secretary, the Branch-President had, nevertheless, the responsibility of carrying on the work of the Branch. He was to be complimented not only upon the manner in which he had conducted the business of the Branch during the year, but also upon this last meeting, which had been one of the most interesting.

The vote of thanks was carried with enthusiasm.

The Branch-President, responding, said he had accepted office with a great deal of trepidation, but thanks to the kindness of Mr. Lockwood and all the executive officers, as well as of the members generally, he had managed to come through unscathed. He appreciated the expressions of good will, and assured the members that it had been to him the greatest possible pleasure to preside over the meetings of the Branch.

Davy Bros., Limited

SCHEME OF ARRANGEMENT APPROVED

The unsecured creditors, preference shareholders, and ordinary shareholders of Messrs. Davy Bros., Limited, at meetings held in Sheffield recently, approved a scheme of financial arrangement and the provision of new capital. The scheme provides for a reduction of the capital of the company from £500,000 to £101,750; by writing off 19s. per share on the £1 preference shares and 19s. 6d. per £1 ordinary share. The scheme also provides that the capital be increased by the £398,250 written off by the creation of 398,250 £1 ordinary shares, thus making, with the 90,000 existing unissued shares, 488,250 shares available for issue. Out of these 192,000 shares are to be allotted, credited as fully paid, to the debenture-holders as satisfaction of their debentures, including accrued interest.

Mr. E. J. Fox, who presided, said that the history of the past ten years supplied a full explanation of the predicament in which the company found itself in the middle of last year. The chairman then referred to development last year, and mentioned that from August, 1934, up to March 31, 1935, orders to the value of £163,700 were taken in spite of the fact that other orders were lost owing to purchasers being unwilling to place themselves in the hands of a company with a receiver in control. While work in progress at the time of the receiver being appointed was £27,631, the corresponding figure on February 28 last was £57,632. During the whole period of the receivership the works had been fully employed. In fact, it had been necessary to work overtime in order to get the work through the shops.

Edgar Allen & Company, Limited

The scheme proposed by the board of Messrs. Edgar Allen & Company, Limited, Sheffield, for the reorganisation of the company's capital was submitted to meetings of the ordinary and preference shareholders respectively and to an extraordinary general meeting held recently.

The chairman briefly explained the causes which had necessitated the writing down of capital, and in recommending the scheme to the shareholders referred to the necessity of making an equitable arrangement in respect of the arrears of preference dividend. The directors were of the opinion that the method proposed was fair and reasonable to both classes of shareholders. The scheme was approved by the required majority at each of the three meetings and the petition for its confirmation will be presented to the Court in due course.

The scheme provides for the writing down of the ordinary share capital by £136,148, thus reducing each £1 ordinary share to a fully-paid share of 13s. 4d. The three years' arrears of preference-share dividend, amounting to £45,000, is to be satisfied by the issue to preference shareholders of 67,500 ordinary shares of 13s. 4d. each in the reduced capital (equivalent to a nominal value of £45,000), of which shares two-thirds are to be contributed by the ordinary shareholders and the remaining one-third by the capitalisation of the balance of the reserve. The rate of dividend on the preference shares is to be reduced from 5 per cent. free of tax to 5 per cent. subject to tax.

A party of forty British engineers and metallurgists, led by Prof. W. H. Merrett, of the Royal School of Mines, arrived at Cologne early this week to make a tour of the iron works and foundries of the Rhineland. They are to visit Düsseldorf, Dortmund, Essen and Duisburg, where they will be given civic receptions.

Heat and Power as By-Products

An informal discussion was held by the Institute of Fuel at British Industries House Club, London, on Friday, March 29, when Mr. C. S. Darling, of Messrs. Rickett, Cockerell & Company, Limited, discussed the possibilities of obtaining heat and power as a by-product in the operation of works' generating plants and indicated some of the financial advantages to be obtained as compared with taking electric power even at very low prices from public supply mains. The speaker emphasised that back pressure was a determining factor in the working costs of plants. Not only did this affect the engine power and the initial cost but it also affected the cost of piping, insulation, etc., and the heat-absorbing material. He instanced a plant in which, in spite of a normal evaporation of only 15,000 lbs. of steam per hr. at 415 lbs. per sq. in., power was provided by a combination of back-pressure and extraction working at a cost of 0.125d. per unit, whereas purchased electric power cost 1.25d. per unit. It was urged that co-operation between the public power supply authorities and industrial power plants with regard to the mutual use of steam and electricity would reduce generating costs and also the investments in generating equipment, thus ultimately reducing the national fuel bill and/or power bill. This would result in a wider use of electrical energy.

It was suggested in subsequent discussion that probably 25 million tons of coal were consumed annually for works' process and heating purposes which was said to be 2½ times the annual consumption of electric power stations in this country. In this connection it was proposed that a committee should be formed to investigate ways and means of dealing with steam heating demands in the neighbourhood of power stations as it might be possible to secure an efficiency of 60 per cent. with these power stations instead of the present 25 per cent.

A point called attention to by one speaker was the necessity for means for treating the returned hot water from such a system so that it could be clean for the boilers again, and this meant capital expenditure. Some surprise was expressed that the supply of steam or hot water had not been considered in connection with the Grid stations and contending that we could not face for ever power stations with an efficiency of only 25 per cent. The speaker put forward the view that a number of smaller stations should be erected in thickly-populated industrial areas for the purpose of supplying heat in the way of steam or hot water or both, as well as electricity.

Firm's History

Mr. James A. Morris, chairman of directors of Messrs. Glenfield & Kennedy, Limited, Kilmarnock, in the course of a speech at the Glenfield Bulb Show recently, mentioned that he had been for a considerable time gathering information regarding the origin and progress of the Glenfield works, and intended shortly to publish a history of the undertaking from its beginning at Townholm in the early fifties of last century till the present day. The development of the Glenfield works since its removal to Low Glencairn Street in 1865 has been phenomenal. Mr. Morris has a long personal connection with the works and his forebears have been shareholders and have served on various boards from the very start. He has had access to private records and has had personal interviews with a number of the oldest employees, so that he has been able to gather a great deal of valuable information. It is understood that Mr. Morris intends to deal more with the human side than the technical side of the business. The Glenfield works has always been famous for the fine family feeling that has existed between employees and employers—a feeling which is probably stronger to-day than at any previous time in its history, and the forthcoming volume from the pen of Mr. Morris is certain to be of a most interesting and intimate nature.

Pipe Dipping Plant

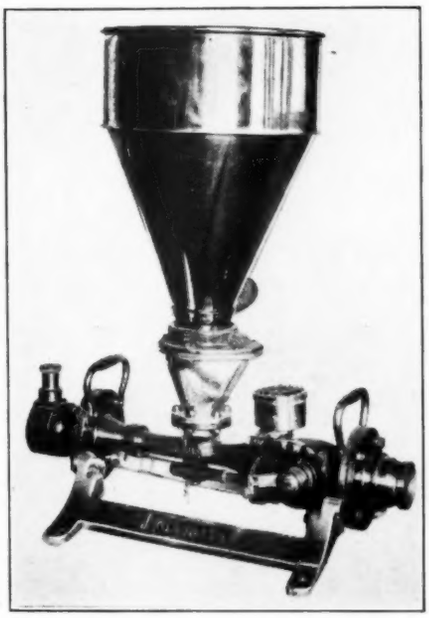
MODERN METHODS OF EXTINGUISHING TAR FIRES

It is well known that fires caused by burning tar, pitch, bitumen and similar products used for pipe-dipping are extremely difficult to extinguish by means of water. For general use, such as in connection with foundries, much the most efficient and convenient method of dealing with fires of this character is foam, that is, a mass of bubbles filled with carbon dioxide gas.

A short time ago, for example, at a foundry in the North of England there was a very narrow escape from disaster when a large pipe-dipping tank containing 3,000 gallons of tar nearly became ignited.

This tank is heated from underneath by means of a gas-fired combustion chamber, and a leakage developed, so that tar passed down into the chamber and became ignited, causing an underground fire. However, the local fire brigade were able to prevent the disaster by using the "Foamite" continuous generator, discharging into the flues and stifling the fire by driving out the air. They only accomplished this in the nick of time, since the tar was already giving off a large amount of vapour and would soon have been ignited. Had the dipping tanks proper become involved the fire would probably have spread to all the surrounding buildings.

This method of fire-fighting is a speciality of Foamite Firefoam, Limited, and the basic principle consists in the use of two powders, an acid and an alkali, which on mixing in solution in water generate a vast volume of bubbles. These powders are a bi-carbonate with the addition of a foam stabiliser, which is an organic colloid, and a harmless acid salt. The latter reacts with the bi-carbonate to form carbon dioxide gas, in addition to a hydrate, which composes the walls of the bubbles, enclosing the gas. Also, it may be stated, the action of the colloidal stabiliser is to strengthen the film walls, so that the bubbles do not collapse on contact with the fire.



STANDARD FOAMITE "CONTINUOUS FOAM GENERATOR."

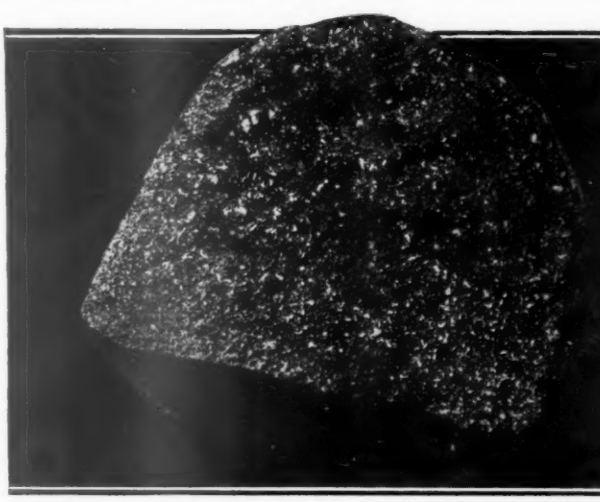
In general the action of a mass of wet, closely-associated, tough small bubbles, filled with carbon dioxide, and discharging under considerable pressure, is elimination of the air or "blanketing," as already indicated, but combined also with a considerable amount of local cooling and reduction of the temperature below ignition point. In this latter connection, therefore, the action somewhat resembles that of water, without, of course, the troubles due to flooding. Further, carbon dioxide gas, combined with cooling, will extinguish almost any flames immediately, including those from fiercely-burning petrol, alcohol, ether, and fuel oil, for example, in addition to pitch, tar, bitumen, oils and fats, and varnish. Also a jet of foam can be used with safety in connection with high-tension electrical equipment.

The foam method is available for use in many different ways, but the continuous generator as employed at this particular fire in the North of England consists of a hopper into which is poured dry mixed powders, discharging to a short horizontal injector apparatus at the bottom, and having at each end instantaneous fire-hose connections. For use the hose is coupled to pressure water mains or to pumps and the water (fresh or salt) passed through, when the mixing powder is drawn into the water stream, instantly generating a huge volume of bubbles which is discharged under considerable pressure in the form of a jet.

These generators also are made in various sizes, a typical one of the smaller units taking, under water pressure conditions of 100 lbs. per sq. in., 50 galls. of water and 90 lbs. of mixed powder per min., and giving 450 galls. of foam in this time, while a wide range of small hand-extinguishers is also available.

SUNDERLAND TOWN COUNCIL has accepted the tender of the Whessoe Foundry & Engineering Company, Limited, Darlington, at £17,588, for the supply and installation of an oil-bunkering appliance on the new Deep Water Quay.

DORMAN LONG



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PIG IRON

This Week's News in Brief

Trade Talk

At the annual meeting of Messrs. A. Reyrolle & Company, Limited, Hebburn-on-Tyne, it was stated that it was intended to spend £20,000 on new plant.

The L.M.S. Railway are preparing a chromium-plated engine at their Crewe works in commemoration of the King's jubilee. Every part will be chromium-plated.

Messrs. Robert Stephenson & Company, Limited, Darlington, have received a contract from the Egyptian State Railways for the supply of boilers to the value of £3,000.

Edinburgh Town Council has accepted the tender of the Stanton Ironworks Company, Limited, Nottingham, for the supply of about 700 tons of cast-iron pipes of various sizes.

At the annual meeting of the Federation of British Industries, held in London recently, Sir Francis Joseph was elected President of the Federation for the coming year in succession to Lord Herbert Scott. The vice-presidents were re-elected with the following additions:—Mr. J. L. Ferguson and Mr. P. J. Hannon, M.P.

At the annual meeting of the United Flexible Metallic Tubing Company, Limited, to be held on April 25, a resolution will be proposed providing for the alteration of the nominal value of the shares from 16s. to 10s. The present issued capital is £169,600. Under the new proposals five existing 16s. shares would become eight 10s. shares.

About 80 members of the Chemical Engineering group, Yorkshire section of the Society of Chemical Industry, of the Refractories Association and the Refractories section of the Ceramic Society, paid a visit recently to the works of Messrs. Edgar Allen & Company, Limited, Imperial Steel Works, Sheffield. In the evening a joint meeting was held at the Grand Hotel, Sheffield.

The net average realised price of No. 3 Cleveland pig-iron during the first quarter of 1935 has been officially certified to be 58s. 3.08d. per ton, compared with 57s. 4.15d. per ton in the previous quarter. Under the sliding scale this means an advance of 1 per cent. in the Cleveland blast-furnacemen's wages, which henceforth will be 8¼ per cent. above standard. The advance took effect as from April 7.

Messrs. Vickers-Armstrongs, Limited, have purchased the ship-repairing and dry-dock business of the Messrs. Palmers Shipbuilding & Iron Company, Limited, at Hebburn-on-Tyne. An announcement to this effect was made by Sir Charles Craven, managing director of Messrs. Vickers-Armstrongs, at the launch at Barrow, on April 4, of the new P. & O. liner "Strathmore," which was named by the Duchess of York.

The Sixth International Congress for Scientific Management is to be held in London from July 15 to 20 this year, under the patronage of H.R.H. the Prince of Wales. A varied series of Papers has been secured. The necessary financial help has been given by industrial companies, banks, commercial houses and by professional and scientific bodies, as well as by individuals interested in particular sections of the Congress.

An order has been placed with Messrs. William Beardmore & Company, Limited, for 20 sets of the valve gears required for the locomotives being built by Messrs. North British Locomotive Company, Limited, Springburn, Glasgow, for the Egyptian State Railway, and is valued at about £10,000. The order will ensure steady employment for about 100 men for six months. The marine shop at Dalmuir will close down on the completion of some Admiralty work in hand, but the plant has been reorganised to produce Diesel engines and Caprotti valve gear.

Firms in the Renfrew area have secured in the past week considerable contracts. The Harbour Board of Auckland, New Zealand, have placed an order with Messrs. Lobnitz & Company, Limited, for a twin-screw tug with engines developing about 1,500 horse-power. Messrs. Babcock & Wilcox, Limited, have secured a £10,000 order for electric cranes from the Harbour Board of Klaipeda, Lithuania, in addition to a number of large contracts which the firm have recently secured from abroad. Messrs. Simons & Company, Limited, have engaged extra men for the construction of a new diving-bell barge for the Clyde Navigation Trustees.

Barimar, Limited, of 14-18, Lamb's Conduit Street, London, W.C.1, celebrate this year their 30th anniversary. Under the energetic control of the managing director, Mr. C. W. Brett, M.I.W.E., who has been with the concern since its incorporation, the Barimar factories have been completely reorganised, including those in Birmingham, Glasgow, Manchester and Newcastle-upon-Tyne. More work can now be handled and facilities are available for dealing easily with parts weighing so much as 10 tons. The special department inaugurated some time ago for handling repairs to parts of Diesel engines has been considerably extended under the advice and assistance of Mr. R. Ralph Horne.

We understand that Messrs. Stewarts and Lloyds, Limited, and the British Mannesmann Tube Company, Limited, acting in collaboration, have been successful in securing an important order from the Argentine Government Oilfields for oil-well casing and other tubular requirements, the total value of the contract being approximately £250,000. The sizes of pipe involved vary from 24 in. to 4 in dia., and will be manufactured in the Glasgow and South Wales areas. It would appear that the placing of this large order in Great Britain is a direct consequence of the Anglo-Argentine Trade Agreement, and that the two Governments worked harmoniously and successfully together while the contract was under negotiation, the closest touch being maintained throughout between H.M. Government and the firms responsible for the successful tender.

A further advance of 2½ per cent. in wages has been made in accordance with the sliding scale of the Midland Iron and Steel Wages Board. The sliding scale moves in correspondence with selling prices, a variation of 5s. in the average price obtained by a number of selected firms equalling 2½ per cent. in the rate of workmen's pay. In the trading of January and February last, the two months on which the first ascertainment this year is based, the average selling price was £9 12s. 10d. per ton, compared with £9 10s. 2d. in November and December, and a balance brought forward completed the 5s. entitling the workpeople to an advance. Wages under the sliding scale are now 30 per cent. above the basis, which is 13s. 6d. for puddling. In twelve months they have advanced 10s. For the first two months of 1934 the average selling price was £8 17s. 2d. The price of Staffordshire marked bars has not varied. Other products have been put on a higher level in connection with the controls established as part of the scheme for reorganising the iron and steel industry.

Company Reports

Robert Stephenson & Company, Limited.—Final dividend of 2 per cent.

Aluminium Corporation, Limited.—Net profit for 1934 of £4,496, which reduces the debit brought in to £16,624.

P. & W. MacLellan, Limited.—Profit for 1934 of £164, after crediting a surplus of £7,657 on sale of investments and after meeting debenture interest, but before providing for depreciation. The debit on profit and loss account to be carried forward now stands at £170,932.

Iron Trades Employers' Insurance Association, Limited.—Premium income in 1934, £712,304; from dividends and interest, £92,701; brought in, £82,862; compensation and incidental expenses, £533,361; balance on net revenue account, £283,605; return of 15 per cent. of workmen's compensation premium, together with bonus of 15 per cent. on which tax has already been paid, making total return of 30 per cent.

Contracts Open

Parkhurst, April 22.—Supply and laying about 200 yds. of 4-in. service pipe, for the Isle of Wight County Council. Mr. S. R. Cocks, 5, St. Thomas Street, Ryde.

Dengie, April 29.—For the Maldon Rural District Council:—(1) Supply of 8 miles 1,717 lineal yds. of 7-in., 13 miles 138 lineal yds. of 6-in., 10 miles 1,587 lineal yds. of 4-in., and 7 miles 220 lineal yds. of 3-in. dia. cast-iron pipes; (2) supply of 73 sluice valves, 38 air valves and 10 hydrants. Mr. W. Almond, engineer, 6, Market Hill, Maldon.

Personal

Sir Charles Craven, managing director of Messrs. Vickers-Armstrongs, Limited, has accepted the presidency of the Tyneside Industrial Development Board.

Mr. John Brown, of Allandale, Castlecary, has been appointed by Messrs. William Jones & Sons, brickmakers, Buckley, Wales, to supervise the erection of kilns for the manufacture of bricks at Orissa, India.

Mr. George Baker, managing director of Messrs. John Baker & Bessemer, Limited, railway-material manufacturers, Rotherham, has been re-elected President of the Rotherham Chamber of Commerce for the fifth year in succession.

Sir Thomas Bell, managing director of Messrs. John Brown & Company, Limited, Clydebank, who retired on March 30, bade official farewell to the members of the staff on April 6. All the shipbuilding and engineering foremen, the management and the local directors were in attendance at a luncheon at which Sir Thomas reviewed his association with the firm since he began work in the establishment 49 years ago. Sir Thomas has been resident director since 1909 and will continue in a consultative capacity until the "Queen Mary" is ready for her first voyage

Wills

Saniter, E. H., of Rotherham, metallurgical chemist	£25,272
Reed, H. A., consulting engineer to the Manchester Ship Canal and chief engineer, 1912-30	£30,947
Ritchie, R. J. H., a director and works manager of Messrs. James & Ronald Ritchie, Limited, Acklam Foundry, Middlesbrough	£6,060

Obituary

Mr. Charles William Corry, northern area representative of Messrs. Brown & Tawse, Limited, iron and steel merchants, of London and Dundee, died on April 8, at the age of 38.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

British Abrasive Wheel Company, Limited, Universal Works, Stafford.—Capital £100.

Repton Foundry, Limited.—Capital £2,000. Directors: A. S. Vardon, 61, Wesley Park Road, Selly Oak, Birmingham; W. Stobart.

B. R. Rowland & Company, Limited, Universal Works, Stafford.—Capital £100. Manufacturers of and dealers in abrasive grinding wheels.

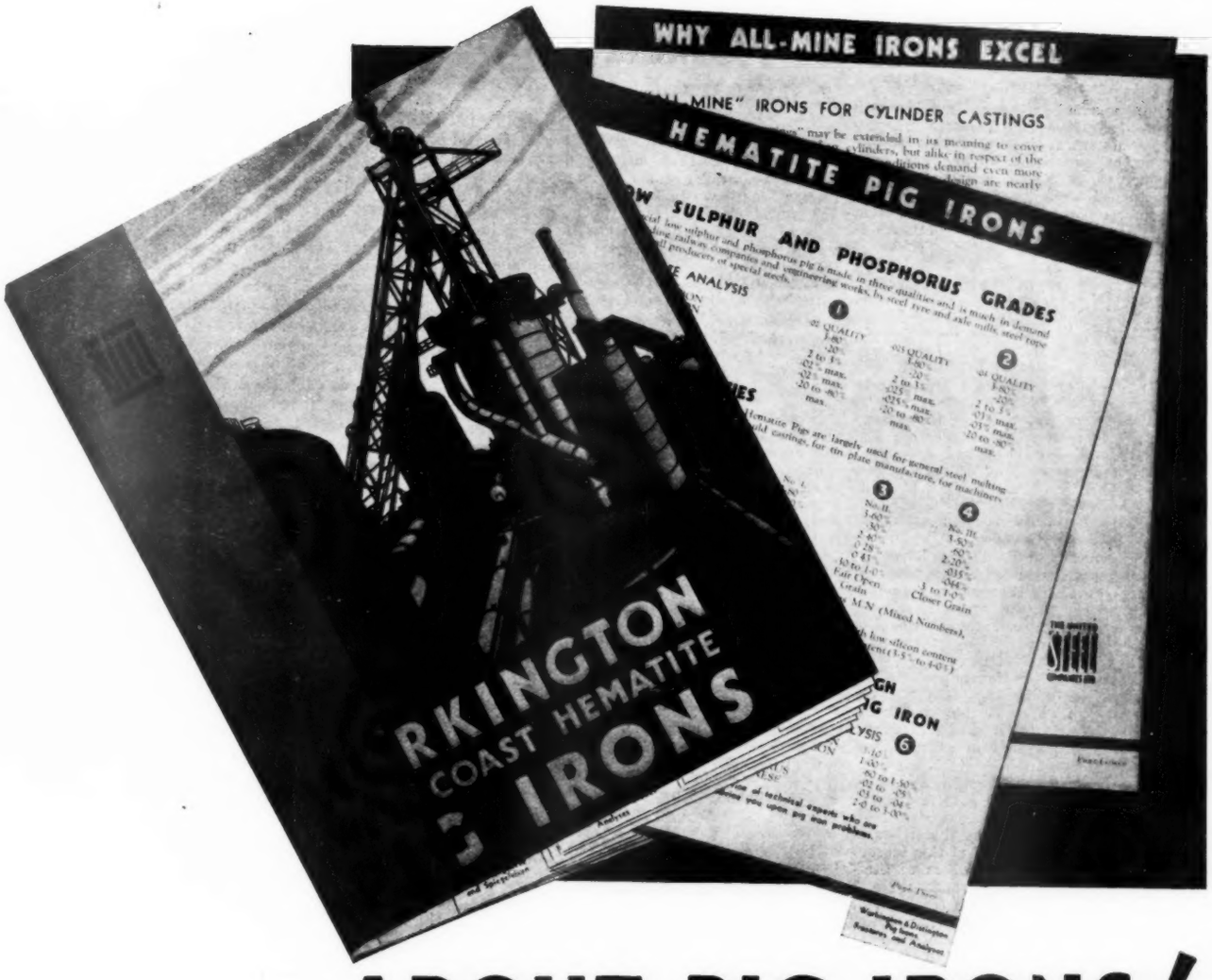
Union Steel & Manufacturing Company, Limited.—Capital £75,000. To take over the business carried on at Usam Works, Granville Street, Wolverhampton, and Wood Lane, Bushbury, Staffs, as the "Union Steel & Manufacturing Company." Directors: J. Hampton, C. J. W. Hampton and R. Hampton.

Walter Macfarlane & Company, Limited, Saracen Foundry, Possilpark, Glasgow.—Capital £100,000 in £1 shares. To acquire the business now carried on by Walter Macfarlane & Company. Subscribers: Walter Macfarlane, ironfounder, Saracen Foundry, Possilpark, Glasgow, and Alexander Cross, barrister-at-law, Battleby, Perth.

Notes from the Branches

Scottish Branch.—In anticipation of the annual conference of the Institute to be held in Scotland in 1936, the Scottish Branch at a Council meeting held on April 10 appointed an executive committee to make the necessary arrangements. The committee consists of Mr. Daniel Sharpe, who will be President of the Scottish Branch in 1936, Mr. Frank Hudson, Vice-President, and Mr. Duncan Walker, Junior Vice-President, together with Mr. John Bell as Conference Secretary.

XUM



ABOUT PIG IRONS!
You should have This

This newly-published twenty-four page Brochure contains useful information about Pig Irons. Every foundryman should have his copy.

The thumb index opens at these sections :—

- Hematite Pig Irons—Fractures and Analyses.
- "UCO" All-Mine and Cylinder Irons.
- Sizes of Pigs.
- Refined Pig Irons—Fractures and Analyses.
- Ferro-Manganese and Spiegeleisen.
- Shipping Facilities.

WORKINGTON IRON & STEEL COMPANY

Branch of
The United Steel Companies Limited

WORKINGTON CUMBERLAND

PLEASE USE THE COUPON BELOW.

THE UNITED STEEL COMPANIES LTD., PUBLICITY DEPT., SHEFFIELD, 10.

Please send.....copies of Booklet, Ref. No. W.175.

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THE UNITED STEEL COMPANIES LTD

RB W17

Raw Material Markets

Since the commencement of the year there has been a steady and fairly satisfactory demand for pig-iron, but disappointment is expressed that so far the usual spring expansion of buying has been lacking. Any increase in market activity will now have to be postponed until after the holiday, of course. Satisfactory reports have been received from the steel trade generally, and the outlook is definitely encouraging.

Pig-Iron

MIDDLESBROUGH.—Business has been dull on the Cleveland iron market during the past week. Trading has been confined to small parcels for early delivery, and consumers are showing a tendency to hold back and await events. Another disappointing feature has been a further contraction in the already limited export trade. However, ironmasters are now operating on a profit-earning basis and are seemingly content with the present level of fixed prices, which are governed by No. 3 Cleveland G.M.B. at 67s. 6d. per ton delivered Middlesbrough, 69s. 6d. delivered North-East Coast, 67s. 3d. delivered Falkirk and 70s. 3d. delivered Glasgow.

There is a strong demand for East Coast hematite. As production was recently curtailed by the blowing-out of two furnaces at Middlesbrough, a reduction of the outstanding stocks at the works should be speedily effected. Business with Italy is still in a state of suspense, but there are hopes of an early resumption and the completion of certain contracts which were vetoed under the Italian import restrictions. Export prices are understood to be in the region of 61s. per ton, f.o.b., but the fixed home minimum figure for No. 1 East Coast hematite remains at 69s. per ton delivered in the Middlesbrough area.

LANCASHIRE.—The aggregate rate at which pig-iron is going into consumption at foundries in this area shows no falling off as compared with recent months, but still fails to make the improvement which might have been expected at this season. The market is steady, with current offers of Staffordshire, Derbyshire and Lancashire brands of No. 3 foundry iron equal to Derbyshire all on the basis of 74s. per ton for delivery to users in the Lancashire zone, Northamptonshire iron being maintained at 72s. 6d., Scottish No. 3 at from 81s. 6d. to 82s. 6d., West Coast hematite at about 78s. 6d., and East Coast hematite at from 75s. to 76s., according to quality.

MIDLANDS.—The present lack of activity in the pig-iron market was not unexpected, as so many consumers covered their forward requirements early in the year, to the end of June in most cases. An unsatisfactory feature for this time of the year is that some of the largest light-castings manufacturers are still on short time. The prices of common irons are controlled, the figures, delivered Birmingham and Black Country stations, being 67s. 6d. per ton for Northants No. 3 and 71s. per ton for Derbyshire, Lincolnshire and North Staffordshire No. 3. There is a small sliding-scale rebate to consumers who confine themselves to certain sources of supply. There has been no alteration in the situation governing pig-iron for the general engineering and jobbing trades. Many grades of iron are used for this work, prices varying widely according to quality and analysis, medium-phosphorus pig-iron being 72s. to 80s., low-phosphorus 85s. to 87s. 6d. (the former being the figure for No. 3 Scottish iron), while refined irons are offered between £5 7s. 6d. and £7 per ton delivered Black Country stations.

SCOTLAND.—A good demand for steelmaking irons is reported from the Glasgow iron market, but purchases of Scottish foundry iron continue to be principally of a hand-to-mouth nature. There is no change in the official minimum prices, viz., 70s. for No. 3 f.o.t. furnaces, with 2s. 6d. per ton extra for No. 1. Business in the light-castings section of the trade continues on satisfactory lines and the prospects are hopeful. Prices of Cleveland foundry iron remain unchanged at 67s. 3d. f.o.t. Falkirk and 70s. 3d. f.o.t. Glasgow for No. 3 foundry.

Coke

The cupola-coke market remains firm. Quotations for delivery in the Birmingham area are as follow:—Best Durham coke, 36s. to 40s.; other grades down to 34s.; Welsh coke, 34s. to 43s. 6d.; Scottish low-ash coke, 40s. to 41s. per ton.

Steel

Rather less apprehension is now felt regarding the effects of Belgian currency depreciation on the British steel trade, although the outlook in this connection is still very obscure. As regards heavy products, the plate mills are in need of orders, but structural steel continues to be in fair request, and the works have a good volume of orders in hand for railway material. The steelworks and the re-rollers have benefited from the absence of Continental competition in small bars and strip, and their position should improve further as stocks of foreign material are worked off.

Scrap

Scrap-iron prices are generally firm. In the Cleveland district buyers readily offer 55s. for machinery metal and 53s. for heavy machinery cast iron. A steady demand and unchanged prices are reported from the Midlands. In South Wales, heavy cast iron is in spasmodic demand at between 50s. and 52s. 6d., whilst there is only a very limited call for machinery grade at 52s. 6d. to 55s. per ton. In Scotland, good heavy machinery cast-iron scrap, in cupola sizes, is firm at 56s. 6d., with ordinary cast iron to the same specification at 52s.

Metals

Copper.—The copper position has gradually strengthened during the past fortnight, under the pressure of steady buying here and on the Continent. To a certain extent, the recent purchasing can be ascribed to speculative operations; the depreciation of the belga led to the investment of much capital in commodities, and war fears have also led to the building-up of stocks of copper abroad. At the same time, it is believed there has been an increase in the demand for copper for ordinary commercial use, and the market is correspondingly cheerful.

Daily quotations :—

Cash.—Thursday, £31 11s. 3d. to £31 12s. 6d.; Friday, £31 13s. 9d. to £31 16s. 3d.; Monday, £31 12s. 6d. to £31 13s. 9d.; Tuesday, £31 7s. 6d. to £31 8s. 9d.

Three Months.—Thursday, £31 18s. 9d. to £32; Friday, £32 2s. 6d. to £32 5s.; Monday, £32 1s. 3d. to £32 2s. 6d.; Tuesday, £31 16s. 3d. to £31 17s. 6d.

Tin.—The tin market, under the rigid control exercised, is once again presenting a firm front, although doubts are expressed as to the true stability of the structure. At the moment the withholding of prompt supplies, coupled with the usual seasonal activity in the consuming trades, means that consumers, particularly in the United States, find it difficult to secure metal quickly when their needs out-run their contract deliveries. The present "squeeze" is not expected to last, however, and it is not too certain what the subsequent behaviour of the market will be.

Market fluctuations :—

Cash.—Thursday, £225 5s. to £225 10s.; Friday, £226 15s. to £227 5s.; Monday, £226 5s. to £226 10s.; Tuesday, £226 15s. to £227.

Three Months.—Thursday, £221 10s. to £222; Friday, £224 to £224 5s.; Monday, £222 10s. to £223; Tuesday, £223 to £223 10s.

Spelter.—Small fluctuations in price have occurred in this market, which is still over-shadowed by the possibility of revision of the present duty on imports of foreign spelter. Stocks of zinc in the U.S.A. showed a drop of 4,924 tons during March.

Official quotations :—

Ordinary.—Thursday, £12 16s. 3d.; Friday, £12 16s. 3d.; Monday, £12 17s. 6d.; Tuesday, £13 1s. 3d.

Lead.—As in the case of spelter, chief interest in the lead market centres upon the plans being set before the Import Duties Advisory Committee for remodelling the import duty. It is believed that the latest proposal is to substitute a smaller specific duty for the present 10 per cent. *ad valorem* duty.

Day-to-day prices :—

Soft Foreign (Prompt).—Thursday, £12 3s. 9d.; Friday, £12 5s.; Monday, £12 7s. 6d.; Tuesday, £12 8s. 9d.

Catalogue Received

Electric Furnaces. The Electric Furnace Company, Limited, of 17, Victoria Street, London, S.W.1, have recently prepared two pamphlets B5 and E6, the former of which deals with the Ajax Wyatt induction furnace and the latter the Ajax Northrup high frequency. In general terms B5 is of paramount interest for the non-ferrous foundry and E6 for the steel and grey iron. It is astounding to learn that in the world there are more than 1,000 Ajax Wyatt furnaces in operation with a combined annual output of 4,000,000,000 lbs. The English capacity from 80 furnaces is of the order 350,000,000 lbs. of brass per annum. We have in recent years taken a profound interest in costing, and whilst we can appreciate the reliability of the figures on page 4, we suggest that a depreciation and amortisation figure should be included. After all, there is about 26s. per ton in favour of the electric furnace before taking depreciation into account. Referring now to the Ajax Northrup high-frequency furnace, the costs published in this connection bear out what we have previously been told—that is, that they are of much the same order as the arc-electric furnace, excluding the cost of electrodes. Amongst the dozen or so applications to which the high-frequency furnace is put, none is more interesting than (*k*) the conversion of molten pig-iron into steel, with the elimination of carbon, silicon, manganese, phosphorus and sulphur. This represents a development which we should never have anticipated from this type of furnace owing to the low ratio of metal area to mass available for slag reactions. However, we confess that the electric-furnace people have made, and are making, such enormous strides, that the unbelievable things of yesterday are routine practice to-day. We predict that the next decade will see the electric furnace well establish itself in the ironfoundry as a recognised process for making high-grade and alloy castings, and on these grounds we suggest our readers should procure a copy of these catalogues for study and filing.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal":—

"DURRAL."—Non-metallic powder for adding to facing sand used in ironfounding, and foundry blacking. James Durrans & Sons, Limited, Phœnix Works, Penistone, Sheffield.

"ALPORTE."—Unwrought and partly-wrought metals. Saml. Gratrix, jun., & Bro., Limited, Quay Street, Deansgate, Manchester.

"FERROGRAN."—Unwrought and partly-wrought ferrous metals. Prodorite, Limited, Eagle Works, Leabrook Road, Wednesbury.

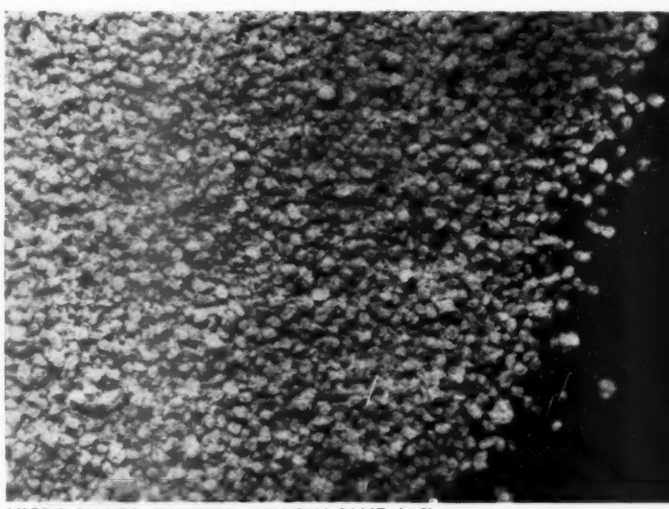
"IAMZITE."—Unwrought and partly-wrought metals. John Williams & Sons (Cardiff), Limited, East Moors Road, Cardiff.

De Lavaud and Mairy Spun-Pipe Patents

The Stanton Ironworks Company, Limited, who are exclusive licensees under the De Lavaud patents, have sub-licensed Cochranes (Middlesbro') Foundry, Limited, to manufacture their centrifugal pipes under these De Lavaud patents for five years commencing January 1, 1935. In view of this the International De Lavaud Manufacturing Corporation has withdrawn their threat of action against the Cochrane Company. It will be recalled that the Cochrane Company are exclusive licensees in this country under the Mairy patents. The Cochrane Company have sub-licensed the Stanton Company to use the Mairy process in conjunction with the De Lavaud system. It follows from the above that the Stanton and Cochrane Companies will in future be making similar pipes and each will be working under both the De Lavaud and Mairy patents.

XUM

Moulders who want a sand with that little extra resistance for casting iron and iron alloys at high temperature, and which will produce a good skin on the casting, will find no better medium than York Yellow Sand. It is well bonded, fine in grain, yet permeable and highly refractory.



YORK YELLOW

MICRO-PHOTO OF YORK YELLOW SAND (x 8)

GENERAL REFRACTORIES LIMITED.

Telephones: Sheffield 22311 (5 lines). London 7361 Temple Bar.

Head Office: Genefax House, Sheffield.

London Office: Russell House, Adelphi, W.C.2.

Telegrams: Genefax, Sheffield. Genefax, Rand, London.

RAW MATERIALS—PRICE LIST

(Tuesday, April 16, 1935)

COPPER

	£ s. d.
Standard cash	31 7 6
Three months	31 16 3
Electrolytic	35 0 0
Tough	33 15 0
Best selected	34 5 0
Sheets	60 0 0
India	45 10 0
Wire bars	35 10 0
Ingot bars	35 10 0
H.C. wire rods	38 10 0
Off. av. cash, March	28 11 0⅝
Do., 3 mths., March	28 18 2½
Do., Sttlmnt., March	28 10 11⅞
Do., Electro, March	31 16 10½
Do., B.S., March	31 9 2
Do., wire bars, March	32 1 6¼
Solid drawn tubes	9¾d.
Brazed tubes	9¾d.
Wire	6¼d.

BRASS

Solid drawn tubes	9d.
Brazed tubes	11d.
Rods, drawn	8¾d.
Rods, extd. or rlld.	4¼d.
Sheets to 10 w.g.	7¼d.
Wire	7⅞d.
Rolled metal	7d.
Yellow metal rods	4¼d.
Do. 4 × 4 Squares	5¾d.
Do. 4 × 3 Sheets	5¼d.

TIN

	£ s. d.
Standard cash	226 15 0
Three months	223 0 0
English	227 0 0
Bars	228 17 6
Straits (nom.)	234 5 0
Australian (nom.)	—
Eastern	233 5 0
Banca	234 15 0
Off. av. cash, March	215 19 5½
Do., 3 mths., March	211 17 1⅝
Do., Sttlmt., March	215 18 9⅛

SPELTER

	£ s. d.
Ordinary	13 1 3
Remelted	13 10 0
Hard	11 0 0
Electro 99.9	15 13 9
English	14 2 6
India	12 10 0
Zinc dust	17 0 0
Zinc ashes	3 0 0
Off. aver., March	12 3 5⅜
Aver. spot, March	12 1 10⅝

LEAD

	£ s. d.
Soft foreign ppt.	12 8 9
Empire (nom.)	13 10 0
English	14 10 0
Off. average, March	11 1 11⅓
Average spot, March	11 0 2⅞

ALUMINIUM

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£ s. d.
Zinc sheets, English	22 10 0
Do., V.M. ex-whse.	23 2 6
Rods	27 15 0

ANTIMONY

	£ s. d.
English	79 0 0 to 80 0 0
Chinese, ex-whse., (nom.)	67 0 0
Crude	—

QUICKSILVER

	£ s. d.
Quicksilver	11 7 6 to 11 17 6

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	8 17 0
45/50%	12 15 0
75%	17 17 6
Ferro-vanadium—	
5/50	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free	4/6 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£15 15 0
Ferro-tungsten—	
80/85%	3/- lb.
Tungsten metal powder—	
98/99%	3 3 lb.
Ferro-chrome—	
2/4% car.	31 10 0
4/6% car.	21 15 0
6/8% car.	21 10 0
8/10% car.	21 10 0
Ferro-chrome—	
Max. 2% car.	34 0 0
Max. 1% car.	36 5 0
Max. 0.70% car.	37 5 0
70% carbon-free	9¾d. lb.
Nickel—99.5/100%	£200 to £205
"F" nickel shot	£184 0 0
Ferro-cobalt, 98/99%	5/- to 5/6 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export	(nom.) £9 15 0
Metallic manganese—	
94/96% carbon-free	1/3 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten 2s. 0d
Finished bars, 18% tungsten 2s. 9d
Per lb. net, d/d buyers' works.

Extras—
Rounds and squares, 3 in. and over 4d. lb.
Rounds and squares, under ½ in. to ¼ in. 3d. lb.
Do., under ¼ in. to $\frac{3}{16}$ in. 1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in. 3d. lb.
Do., under ⅛ in. × ¼ in. 1/- lb.
Bevels of approved sizes and sections 6d. lb.
Bars cut to length, 10% extra.

SCRAP

	£ s. d.	£ s. d.
South Wales—		
Heavy steel	2 15 0	to 2 16 0
Bundled shrngs.		2 7 6
Mixed iron and steel	2 10 0	to 2 12 0
Heavy cast iron	2 10 0	to 2 12 6
Good machinery	2 12 6	to 2 15 0
Cleveland—		
Heavy steel	2 11 6	to 2 12 6
Steel turnings		1 15 0
Cast-iron borings		1 5 0
Heavy cast iron		2 13 0
Heavy machinery		2 15 0
Midlands—		
Light cast-iron scrap		2 7 6
Heavy wrought iron	2 17 6	to 3 0 0
Steel turnings, f.o.r.		1 14 0
Scotland—		
Heavy steel		2 10 0
Ordinary cast iron		2 12 0
Engineers' turnings		1 19 6
Cast-iron borings		1 18 0
Wr'ght-iron piling	2 16	3 to 2 17 6
Heavy machinery		2 16 6

London—Merchants' buying prices, delivered yard.

	£ s. d.
Copper (clean)	26 0 0
Brass	17 10 0
Lead (less usual draft)	10 10 0
Tea lead	7 15 0
Zinc	9 0 0
New aluminium cuttings	66 0 0
Braziery copper	22 0 0
Gunmetal	24 0 0
Hollow pewter	152 0 0
Shaped black pewter	105 0 0

PIG-IRON

N.E. Coast (d/d Tees-side area)—

Foundry No. 1	70/-
Foundry No. 3	67/6
,, at Falkirk	67/3
,, at Glasgow	70/3
Foundry No. 4	66/6
Forge No. 4	66/6
Hematite No. 1	69/-
Hematite M/Nos.	68/6

N.W. Coast—

Hem. M/Nos. d/d Glas.	72/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-

Midlands (d/d Birmingham dist.)—

Staffs No. 4 forge	67/-
,, No. 3 fdry.	71/-
Northants forge	63/6
,, fdry. No. 3	67/6
,, fdry. No. 1	70/6
Derbyshire forge	67/-
,, fdry. No. 3	71/-
,, fdry. No. 1	74/-

Scotland—

Foundry No. 1, f.o.t.	72/6
,, No. 3, f.o.t.	70/-
Hem. M/Nos. d/d	71/-

Sheffield (d/d district)—

Derby forge	64/6
,, fdry. No. 3	68/6
Lincs forge	64/6
,, fdry. No. 3	68/6
E.C. hematite	81/6
W.C. hematite	83/6

Lancashire (d/d eq. Man.)—

Derby fdry. No. 3	74/-
Staffs fdry. No. 3	74/-
Northants fdry. No. 3	72/6
Cleveland fdry. No. 3	74/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	82/-
Clyde, No. 3	82/-
Monkland, No. 3	82/-
Summerlee, No. 3	82/-
Eglinton, No. 3	82/-
Gartsherrie, No. 3	82/-
Shotts, No. 3	82/-

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£ s. d.	£ s. d.
Bars (cr.)	9 12 6	to 9 15 0
Nut and bolt iron	7 10 0	to 8 0 0
Hoops	10 10 0	and up.
Marked bars (Staffs) f.o.t.	12 0 0	
Gas strip	10 10 0	and up.
Bolts and nuts, ¾ in. × 4 in.	14 2 6	and up.
Steel—		
Plates, ship, etc.	8 15 0	to 8 17 6
Boiler plts.	9 5 0	to 9 7 6
Chequer plts.		10 7 6
Angles		8 7 6
Tees		9 7 6
Joists		8 15 0
Rounds and squares, 3 in. to 5½ in.		9 7 6
Rounds under 3 in. to ⅜ in. (Untested)		8 12 0
Flats—8 in. wide and over		8 12 6
,, under 8 in. and over 5 in.		8 17 6
Rails, heavy	8 5 0	to 8 10 0
Fishplates	12 5 0	to 12 10 0
Hoops (Staffs)		9 7 0
Black sheets, 24g. (4-t. lots)		10 10 0
Galv. cor. shts. (,,)		13 0 0
Galv. flat shts. (,,)		13 10 0
Galv. fencing wire, 8g. plain		14 10 0
Billets, soft	5 10	0 and up.
Billets, hard	6 17 6	to 7 2 6
Sheet bars	5 0 0	to 5 7 6
Tin bars	5 2 6	to 5 7 6

PHOSPHOR BRONZE

	Per lb. basis.
Strip	9½d.
Sheet to 10 w.g.	10½d.
Wire	11½d.
Rods	10½d.
Tubes	13½d.
Castings	12d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1 3½
Ingots rolled to spoon size	10d. to 1 6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	20.26
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic, Valley	18.00
Bessemer	20.76
Malleable, Valley	18.50
Grey forge, Valley	18.00
Ferro-mang. 80%, seaboard	85.00
O.-h. rails, h'y, at mill	36.37½
Billets	27.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.80
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.60
Plain wire	2.30
Barbed wire, galv.	3.00
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 30/-
,, furnace	19/- to 20/-
Durham foundry	19/- to 22/-
,, furnace	16/6 to 17/9
Midlands, foundry	—
,, furnace	—

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	18/2 to 19/2
,,	28×20 ,,	36/4 to 38/4
,,	20×10 ,,	26/- to 26/3
,,	18¾×14 ,,	18/6 to 18/9
C.W.	20×14 ,,	15/6 to 16/6
,,	28×20 ,,	33/- to 33/6
,,	20×10 ,,	23/- to 24/-
,,	18¾×14 ,,	16/- to 17/-

SWEDISH CHARCOAL IRON & STEEL

	£ s. d.	£ s. d.
Pig-iron	£6 0 0	to £7 0 0
Bars-hammered, basis	£16 0 0	to £16 10 0
Bars and nail-rods, rolled, basis	£15 15 0	to £16 0 0
Blooms	£10 0 0	to £12 0 0
Keg steel	£30 0 0	to £31 0 0
Faggot steel	£18 0 0	to £23 0 0
Bars and rods dead soft, st'l	£10 0 0	to £12 0 0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

	£	s.	d.		
Apr. 11 ..	31	11	3	inc.	1/3
,, 12 ..	31	13	9	,,	2/6
,, 15 ..	31	12	6	dec.	1/3
,, 16 ..	31	7	6	,,	5/–

Electrolytic Copper

	£	s.	d.		
Apr. 11 ..	35	5	0	inc.	5/–
,, 12 ..	35	10	0	,,	5/–
,, 15 ..	35	5	0	dec.	5/–
,, 16 ..	35	0	0	,,	5/–

Standard Tin (cash)

	£	s.	d.		
Apr. 11 ..	225	5	0	inc.	40/–
,, 12 ..	226	15	0	,,	30/–
,, 15 ..	226	5	0	dec.	10/–
,, 16 ..	226	15	0	inc.	10/–

Tin (English ingots)

	£	s.	d.		
Apr. 11 ..	225	15	0	inc.	35/–
,, 12 ..	227	5	0	,,	30/–
,, 15 ..	226	10	0	dec.	15/–
,, 16 ..	227	0	0	inc.	10/–

Spelter (ordinary)

	£	s.	d.		
Apr. 11 ..	12	16	3	No	change
,, 12 ..	12	16	3	,,	,,
,, 15 ..	12	17	6	inc.	1/3
,, 16 ..	13	1	3	,,	3/9

Spelter (Electro, 99.9 per cent.)

	£	s.	d.		
Apr. 11 ..	15	8	9	dec.	1/3
,, 12 ..	15	8	9	No	change
,, 15 ..	15	10	0	inc.	1/3
,, 16 ..	15	13	9	,,	3/9

Zinc Sheets (English)

	£	s.	d.		
Apr. 11 ..	22	10	0	No	change
,, 12 ..	22	10	0	,,	,,
,, 15 ..	22	10	0	,,	,,
,, 16 ..	22	10	0	,,	,,

Lead (English)

	£	s.	d.		
Apr. 11 ..	14	0	0	No	change
,, 12 ..	14	5	0	inc.	5/–
,, 15 ..	14	5	0	No	change
,, 16 ..	14	10	0	inc.	5/–

Imports and Exports of Pig-Iron, Iron and Steel Castings, etc., in March and the three months, 1935, compared with a year ago.

	March.		Three months.		March.		Three months.	
	1934.	1935.	1934.	1935.	1934.	1935.	1934.	1935.
	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Imports.								
Pig-iron—from British India	6,009	11,769	23,213	24,262	16,295	34,087	63,330	70,572
,, Foreign Countries	997	837	4,345	3,369	5,852	4,802	25,611	19,634
Total	7,006	12,606	27,558	27,631	22,147	38,889	88,941	90,206
Castings and forgings	289	126	529	579	6,336	3,997	13,768	17,462
Cast pipes and fittings	133	77	394	196	8,807	3,429	22,240	9,282
Stoves, grates, etc.	78	79	196	238	8,302	9,149	19,219	21,786
Baths	652	605	1,955	1,558	15,440	16,064	46,585	43,161
Hollow-ware, all kinds	175	232	614	569	9,533	14,912	32,108	36,242
Exports.								
Pig-iron, forge	125	85	249	294	515	464	1,018	1,336
,, foundry	6,806	4,495	15,709	18,026	22,769	16,113	54,729	61,512
,, acid	2,957	2,465	8,724	9,116	9,303	8,004	27,329	29,138
,, basic	—	—	565	203	—	—	1,820	599
Total	9,888	7,045	25,247	27,639	32,587	24,581	84,896	92,585
Castings and forgings	471	337	1,074	1,078	19,238	11,777	42,906	39,804
Cast pipes and fittings, up to 6 in. diameter	4,275	4,845	13,057	13,816	46,985	53,843	150,574	151,389
,, ,, ,, over 6 in. ,,	6,000	3,054	11,228	9,913	43,005	25,367	86,262	79,200
Stoves, grates, etc.	733	591	2,110	2,014	31,629	29,859	102,039	99,102
Sanitary cisterns	230	248	714	849	6,771	6,719	20,440	23,182
Bedsteads, inc. tubes therefor	444	395	1,309	1,093	13,539	15,161	43,001	41,021
Cast hollow-ware	319	335	858	944	10,542	13,428	32,032	36,225

Notice

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 6 words per line. Minimum charge for one insertion 3/-
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SITUATIONS VACANT AND WANTED

FOUNDRY Foreman required for London ironfoundry.—State age, experience and salary required.—Box 230, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of THE FOUNDRY TRADE JOURNAL.

Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, from whom full particulars can be obtained of this service.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

LIGHT-CASTINGS Trade.—Position required as Foreman or Assistant. Experience with first-class light-castings firms, also malleable experience. Technical training. (256)

FOREMAN or Assistant Foreman. Position required by young moulder with supervisory experience in iron and steel works plant and general engineering castings. Understands cupola practice and is technically trained. Position with prospects and opportunities of experience desired. (257)

STEEL-FOUNDRY Foreman requires position. Experience in alloy-steel castings. Heavy shipping, valve, locomotive and general engineering. Estimate all foundry operations. (258)

IRONFOUNDRY Foreman seeks re-engagement. Thoroughly experienced in light castings on most up-to-date plant, including mechanisation. Sound technical training; would take full charge or any situation offering prospects. (259)

PRACTICAL Foundryman with sound experience of mixing of aluminium and special alloys desires position. (260)

PUBLICATION

RYLAND'S DIRECTORY of the Coal, Iron, Steel, Tinplate, Metal, Engineering, Hardware and Allied Trades. 1934 edition. Price 42s. cloth bound, 52s. morocco. Order *YOUR* copy *NOW*.—INDUSTRIAL NEWSPAPERS, LIMITED, 49, Wellington Street, Strand, London, W.C.2.

MACHINERY

WANTED, Secondhand Gutmann Rotary Table, 6 ft. dia. or larger.—Particulars to STERLING MANUFACTURING COMPANY, Davis Street, Cubitt Town, London, E.14.

NEW Dwarf Cupola, to melt 10 to 15 cwts. per hr. New Worm-geared Ladles, 5 tons, 25 cwts., 15 cwts. and 10 cwts. capacity. Ungeared Ladles, 15 cwts. and 10 cwts. capacity. Improved Cupola Spark Arresters.—T. DAVIES & SON, West Gorton, Manchester.

SANDBLAST PLANTS

Room Plants, sizes 12 ft. x 12 ft., 12 ft. x 9 ft. and 6 ft. x 6 ft., made up in cast-iron sections.

Barrel Plants, 30 in. dia. x 36 in. long and 30 in. dia. x 18 in. long rotary barrels.

Cabinet Plants, in sizes 4 ft. x 4 ft. x 4 ft., 36-in. dia. and 30-in. dia. operators' cabinets.

Most of the above by Tilghman and complete with Air Compressors.

HAND MOULDING MACHINES

By Adaptable, Pridmore, Darling & Sellars, etc.; Squeezers by Utard (unused), Samuelson and Britannia, also Farwell Universal Type.

Ladles, Grinding Machines, Exhaust Fans, Blowers, Air Compressors and 500 Electric Motors and Dynamos.

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WANTED, one copy of THE FOUNDRY TRADE JOURNAL dated January 5, 1928.—Reply, G. E. STECHERT & COMPANY, 2, Star Yard, Carey Street, London, W.C.2.

FOUNDRY SUPPLIES.—Our two lines, Wax Core Vents and Iron Cement. Highest qualities, lowest prices; quick despatch.—WILLIAM OLSEN, LIMITED, Cogan Street, Hull.

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THE FOUNDRYMAN'S HANDBOOK, written by a practical moulder, containing many useful tables, with ready-reckoner for weighting-down moulds and calculating weights of castings: 48 pages; 10½d. post free from JOSEPH GREER, 47, Harrowgate Road, South Hackney, London, E.9.

'Phone: 287 SLOUGH

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406 OSBORN jolt rollover.
18"×36" TABOR rollover shockless (portable).
40"×30" TABOR rollover shockless.
TWO BRITANNIA No. 1 jolters.
HAND Machines taken in part payment for above or exchanged.
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T.B. 1 Tilghman sandblast barrel.
Small Tilghman rotary table sandblast.

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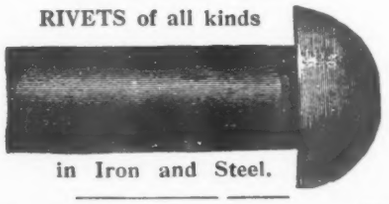

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